

CONNECTICUT RIVER FLOOD CONTROL PROJECT

**SPRINGFIELD, MASS.**

CONNECTICUT RIVER, MASSACHUSETTS

# SPECIFICATIONS

FOR

## LOCAL PROTECTION WORKS

FISCAL YEAR 1939 SECTION, ITEM S.5

CHICOPEE TOWN LINE TO HIGH GROUND-CONTRACT



WAR DEPARTMENT, CORPS OF ENGINEERS, U.S. ARMY

U.S. ENGINEER OFFICE, PROVIDENCE, R.I.

Invitation No. 699-39-345

WAR DEPARTMENT  
UNITED STATES ENGINEER OFFICE  
PROVIDENCE, RHODE ISLAND

June 12, 1939

ADDENDUM NO. 1 to Invitation No. 699-39-345, dated June 9, 1939,  
for construction of concrete flood wall, Springfield-  
Chicopee Town Line to High Ground along the Connecticut  
River at Chicopee, Massachusetts, bids to be opened  
2 P.M., June 22, 1939.

1. Delete Paragraph 1-40, page 17 of Section I of the specifications.
2. This Addendum must be attached to and made a part of your proposal.

J. S. BRADON  
Lieut. Col., Corps of Engineers  
District Engineer

WAR DEPARTMENT  
UNITED STATES ENGINEER OFFICE  
PROVIDENCE, RHODE ISLAND

June 20, 1939

ADDENDUM NO. 2 to Invitation No. 699-39-345, dated June 9, 1939, for construction of concrete flood wall, Springfield-Chicopee Town Line to High Ground along the Connecticut River at Chicopee, Massachusetts, bids to be opened 2 P. M., June 22, 1939.

1. Delete Paragraph 1-10, page 5 of Section I of the specifications, and substitute the following in lieu thereof:

"1-10. Payments. - a. The River and Harbor Act approved September 22, 1922, contains the following provisions:

'That any work of improvement herein adopted and any public work on canals, rivers, and harbors adopted by Congress may be prosecuted by direct appropriations, by continuing contracts, or by both direct appropriations and continuing contracts.'

"b. Under the contract to be entered into under these specifications such work as may be done in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds to be hereafter appropriated.

"c. From funds heretofore appropriated by the Public Works Administration Act of June 21, 1938, appropriation symbol 21-408/00583, and the Emergency Relief Appropriation Act of June 21, 1938, appropriation symbol 713022-658/9999, the sums of \$25,000 and \$70,000, respectively, have been initially allotted and will be reserved for payments in connection with this contract, including all cost of superintendence and inspection and all collateral and incidental expenses in connection therewith. Of the aggregate of these sums, the amount of about \$85,000 is available for payments of the contractor's estimates.

"d. If at any time it becomes apparent to the contracting officer that the remaining balance of this allotment and reservation is in excess of the amount required to meet all payments due and to become due to the contractor, because of work performed and to be performed until June 30, 1939, and for all supervisory, collateral, and incidental expenses in connection therewith until that date, the right is reserved after due notice to the contractor to reduce said allotment and reservation by the amount of such excess.

"e. If the rate of progress of the work is such that it becomes apparent to the contracting officer that the remaining balance of the allotment and reservation is less than that required to meet all payments due and to become due to the contractor because of work performed and to be performed until June 30, 1939, and for all supervisory, collateral, and incidental expenses in connection therewith until that date, the Government may allot and reserve additional funds for payments under this contract if there be funds available for such purpose. The contractor will be advised of any additional allotment so made.

"f. It is expected that prior to June 30, 1939, Congress will make additional appropriations, or the Government will make additional allotments, applicable to work under this contract, but as to this it must be distinctly understood and agreed that the Government is in no case to be made liable for damages in connection with this contract on account of delay in payments on same due to a lack of available funds. Should it become apparent that the available funds will be exhausted before additional funds are appropriated, the contracting officer will give 30 days' written notice to the contractor that work may be suspended; but, if the contractor so elects, he may continue work under the conditions and restrictions of the specifications, after the time set by such notice, so long as there are funds for inspection and superintendence, with the understanding, however, that no payment will be made for such work until additional funds shall have been provided in sufficient amount. When funds again become available, the contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above notices (see also Paragraph 1-07 a).

"g. So long as funds are available, payments will be made monthly in accordance with Article 16 of the contract for work executed and completed as specified or otherwise required, and not included in any prior estimate, except that 10 per cent of the amount of each estimate will be retained until the contract work is 50 per cent completed, and thereafter with each monthly payment there will be paid such portion of the amount so retained as is in excess of 10 per cent of the estimated cost of completing the work remaining to be done, until the amount retained is reduced to \$5,000, after which the amount to be retained will remain unchanged until the completion of the contract.


"h. The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

"i. Should Congress fail to provide the expected additional funds during its regular session, or should additional

allotments fail to be made the contract may be terminated and considered to be completed, at the option of the contractor, without prejudice to him, at any time not later than 30 days after payments are discontinued, or if payments have been previously discontinued, not later than 30 days after the passage of the act which would ordinarily carry an appropriation for continuing the work, or after the adjournment of Congress without passing such act.

"j. In event of termination of the contract prior to its completion, under the terms of Paragraph 1-10 i, hereof, all balances due the contractor under the terms of the contract for work authorized and acceptably executed prior to date of said termination of contract will be paid, including retained percentage and less any proper deductions. The Government will take over, at cost to the contractor, all materials to be incorporated in the structures for which partial payment upon delivery is authorized by the specifications and procurement of which was authorized in writing by the contracting officer, deductions being made for any damaged or unsatisfactory material and for any costs of protection incurred by the Government."

2. This Addendum must be attached to and made a part of your proposal.

  
J. S. BRAGDON  
Lieut. Col., Corps of Engineers,  
District Engineer.

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR CONSTRUCTION OF

CONCRETE FLOOD WALL

SPRINGFIELD-CHICOPEE TOWN LINE TO HIGH GROUND ALONG THE CONNECTICUT RIVER

CHICOPEE, MASSACHUSETTS.

JUNE 9, 1939.

CORPS OF ENGINEERS, U.S. ARMY

U. S. ENGINEER OFFICE

PROVIDENCE, R. I.

No. \_\_\_\_\_ Bidder \_\_\_\_\_

Invitation No. 699-39-345

(Do not write above this line)

STANDARD GOVERNMENT FORM OF INVITATION FOR BIDS  
(Construction Contract)

War Department,  
United States Engineer Office,  
Providence, R. I.  
June 9, 1939.

SEALED BIDS, in duplicate, subject to the conditions contained herein, will be received until 2 p.m., Daylight Saving Time, June 22, 1939, and then publicly opened, for furnishing all plant, labor and materials and performing all work for the construction of a concrete flood wall located on the Connecticut River at Chicopee, Massachusetts, from the Springfield-Chicopee Town Line to High Ground.

I. THE WORK shall be in strict accordance with the specifications, bidding schedule and drawings, designated as follows:

Specifications for construction of Concrete Flood Wall,  
Springfield-Chicopee Town Line to High Ground along the Connecticut River, Chicopee, Massachusetts.

The drawings which will become a part of this contract are designated in Paragraph 1-04 of the specifications.

II. GUARANTEE will be required with each bid as follows:

Bid bond, Standard Form No. 24, will be executed in a penal sum approximately equal to and not less than ten (10) per cent of the total amount of the bid. Individual sureties will justify in sums aggregating not less than double the penalty of the bid bond. (See Paragraph 8 to 11, inclusive, of Instructions to Bidders.) Certified check may be furnished in lieu of bid bond.

III. PERFORMANCE AND PAYMENT BONDS will be required from the successful bidder as follows:

a. A performance bond with good and sufficient surety or sureties, for the protection of the United States, Standard Form No. 25, will be executed in a penal sum approximately equal to and not less than fifty (50) per cent of the full amount of the consideration of the contract.

b. If the consideration of the contract will exceed \$2,000.00 in amount, a payment bond with good and sufficient surety or sureties, for the protection of persons furnishing material and labor for the work, Standard Form No. 25-A, will be executed in a penal sum approximately equal to and not less than fifty (50) per cent of the full amount of the consideration of the contract when the latter is not more than one million dollars (\$1,000,000.00); forty (40) per cent where the contract exceeds one million dollars (\$1,000,000.00) but is not more than five million dollars (\$5,000,000.00); and two million five hundred thousand dollars (\$2,500,000.00) for all contracts above five million dollars (\$5,000,000.00).

IV. LIQUIDATED DAMAGES for delay will be prescribed. (See Paragraph 1-07 of the specifications.)

V. TAX ADJUSTMENTS. - Provisions for tax adjustments will be made a part of the contract. (See Paragraph 1-12 of the specifications.)

VI. PARTIAL PAYMENTS will be made. (See Article 16 of the contract and Paragraph 1-10 of the specifications.)

VII. ARTICLES ON PATENTS will be made a part of the contract. (See Paragraph 1-16 of the specifications.)

VIII. BID AND CONTRACT. - a. Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for construction. The bid form has an entry for each item on which estimates will be given or payments made, and no other allowances of any kind will be made unless specifically provided for in the specifications or the contract. A bid for the entire work must have each blank filled.

b. The quantities of each item of the bid, as finally ascertained at the close of the contract, in the units given and the unit prices of the several items stated by the bidder in the accepted bid, will determine the total payments to accrue under the contract. The unit price bid for each item must allow for all collateral or indirect cost connected with it.

c. The successful bidder will be required to return the contract duly executed and to furnish the performance and payment bonds hereinbefore described, within ten (10) days after the papers are presented to him.

IX. EXPERIENCE. - a. Each bidder shall state in his bid whether he is now or ever has been engaged on any contract or other work similar to that proposed, giving the year in which it was done and the manner of its execution, and shall submit such other information as will tend to show his ability to prosecute vigorously the work required by these specifications.



b. Each bidder shall submit with his bid a list of the number of persons expected to be employed on the work in each class as contained in Paragraph 1-30 of the specifications, and the number of months they will be employed.

X. COMMENCEMENT AND COMPLETION. - Work shall be commenced within ten (10) calendar days after receipt of notice to proceed and shall be completed within 120 calendar days, in accordance with the provisions of Paragraph 1-07 of the specifications.

XI. MINIMUM WAGE RATES for the locality of the work have been determined by the U. S. Department of Labor, and proof of payment of such wages will be required. (See Articles 17 and 19 of the contract and Paragraph 1-35 of the specifications).

XII. ARTICLES ON RELIEF LABOR will be made a part of the contract (see Paragraph 1-30 of the specifications).

XIII. EIGHT-HOUR LAW. - The requirements of the Eight-Hour Law, Article 11 of the contract, will be applicable to the work under the contract.

XIV. ARTICLES ON PREFERENCE for domestic materials will be made a part of the contract. (See Article 18 of the contract and Paragraph 1-31 of the specifications.)

XV. REPORTS TO THE DEPARTMENT OF LABOR. - In order to assist the Department of Labor in obtaining employment statistics, bidders, unless otherwise indicated in their bids, will be considered as having voluntarily consented, without cost to the Government, to the inclusion of Paragraph 1-36 of the specifications as a part of the contract.

XVI. INVESTIGATION OF CONDITIONS. - Samples of borings and from test pits taken at the site can be seen at the U. S. Engineer Laboratory at Providence, R. I., where they should be inspected by prospective bidders. Bidders are expected to visit the locality of the work and acquaint themselves with all available information concerning the nature of the materials to be excavated from the borrow or structure excavations, the nature of the materials to be transported and placed in the embankment and the local conditions bearing on transportation, handling and storage of materials. They are also expected to make their own estimates of the facilities needed, the difficulties attending the execution of the proposed contract, including local conditions, availability of labor, uncertainties of weather, and other contingencies. In no case will the Government assume any responsibility whatever for any interpretation, deduction, or conclusion drawn from the examination of the site. At bidder's request a representative of the Government will point out the site of the proposed operations. Failure to acquaint himself with all available information concerning these conditions will not relieve the successful bidder of assuming all responsibility for estimating the difficulties and costs of successfully performing the complete work.

XVII. FACILITIES AVAILABLE FOR CONSTRUCTION are described in Paragraph 1-06 of the specifications.

XVIII. DATA TO BE SUBMITTED WITH BIDS. - a. Each bidder shall submit with his bid, drawings showing proposed plant layout and charts showing the rate of progress the bidder will maintain on the work, carefully prepared and presented in neat and legible form. These data are considered essential in assisting the contracting officer to determine whether or not the bidder is responsible, experienced in similar types of construction, and that his bid is based on a careful study of construction methods applicable to the work, and prepared with a full realization of the various factors which may affect its progress.

b. The drawings indicating the plant layout shall clearly show the location and manner of employment of the various major items of plant, the method of excavation and disposal of materials, and the manner in which structural features will be erected.

c. The progress charts shall indicate the volume of work to be done and the rate of progress which the bidder agrees to maintain for each of the following major operations required in the performance of the work under these specifications: Excavation, Steel Sheet Piling, Concreting, and Riprap. These charts may be in any convenient form in which the time element shall be plotted to represent definite intervals of time measured from date of notice to proceed with the work, and the volume of work shall be represented by a suitable scale of percentage of completion based on the estimated contract quantities. Careful consideration shall be given to the preparation of the charts as the contractor will be required to maintain the rate of progress indicated thereon.

XIX. PLANT. - Each bidder shall state in his bid the character and amount of plant that he proposes to employ on the work. After bids are opened any bidder may be required to show that he owns, controls or can procure the plant necessary for commencing, prosecuting, and completing the work as required by the specifications.

XX. AWARD OF CONTRACT. - a. Subject to the rights hereinafter reserved, the work will be awarded as a whole to the lowest bidder whose proposal fully conforms to the requirements of the specifications and as may be deemed most advantageous to the Government. The right is reserved as the interest of the Government may require, to reject any and all bids, or to waive any informality in bids received.

b. A bid may be rejected if the bidder cannot show that he has the necessary capital and experience, and owns, controls, or can procure the necessary plant to commence the work at the time prescribed in the specifications and thereafter to prosecute and complete the work at the rate or time specified; and that he is not already obligated for the performance of other work which would delay the commencement, prosecution or completion of the work contemplated in this advertisement.

c. Any unbalanced bid which, in the opinion of the contracting officer, jeopardizes the interest of the Government will be subject to rejection for that reason.

XXI. ADDRESS FOR BIDS. - Bids submitted must be in envelopes with sufficient postage, sealed, marked, and addressed as follows:

(Marked in upper left-hand corner)

Bid for construction of Concrete Flood Wall on the Connecticut River, from Springfield-Chicopee Town Line to High Ground, at Chicopee, Massachusetts. To be Opened June 22, 1939.

(Addressed to)

District Engineer,  
United States Engineer Office,  
819 Industrial Trust Bldg.,  
Providence, R. I.

Note: - See Standard Government Instructions to bidders and copy of the Standard Government Forms of contract, bid bond, payment bond, and performance bond, which may be obtained upon application.

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WAR DEPARTMENT  
UNITED STATES ENGINEER OFFICE  
PROVIDENCE, RHODE ISLAND

APPROPRIATIONS: 713022-658/9999-Emergency Relief,  
War, Corps of Engineers, Public,  
Buildings, Parks, Utilities, Flood  
Control, etc. (Transfer from WPA),  
1938-1939.  
21-408/00583 Public Works Adminis-  
tration Act of 1938 (Allotment to  
War, Flood Control), 1938-1940.

CONCRETE FLOOD WALL, SPRINGFIELD-CHICOPEE TOWN LINE TO HIGH GROUND ALONG  
THE CONNECTICUT RIVER

CHICOPEE, MASSACHUSETTS

S P E C I F I C A T I O N S

SECTION I. GENERAL PROVISIONS

1-01. Location. - The site of the work covered by these specifica-  
tions is located on the east bank of the Connecticut River, in the south  
portion of the City of Chicopee, Massachusetts.

1-02. Work to be done. - a. The work provided for herein is authorized  
by the Flood Control Act of June 28, 1938 (Public No. 761, 75th Congress).

b. The work to be done consists of furnishing all plant, la-  
bor and materials and performing all work required for constructing a re-  
inforced concrete flood wall and all appurtenant structures, complete in  
accordance with these specifications and the drawings forming a part here-  
of, together with such other incidental work at the site as may be required  
for completion of the work within the intent and scope of the specifica-  
tions, or as may be ordered in writing by the contracting officer. It will  
consist of the following major items:

(1) Construction of concrete flood walls between traverse  
stations 62+00 and 82+10, 82+50 and 84+00, and between stations 88+98 and  
92+30, complete with steel sheet piling cut-off and toe drains.

(2) Removal of all trees, grading and riprapping of the  
river bank between traverse stations 62+75 and 81+75.

1-03. Description of the work. - a. The flood wall will be con-  
structed of reinforced concrete, with steel sheet pile cut-off, will be  
approximately 2,480 feet in length, and will have a top elevation aver-  
aging 69.00 feet m.s.l.

b. All trees and brush on the slopes of the river bank will be removed and the slopes will be riprapped; the toe of the river bank will be protected by dumped rock. The berm on the riverside of the wall will be spot sodded and seeded, as indicated on the drawings. Gravel and tile drains will be installed to provide proper drainage for the landside toe of the flood wall.

1-04. Drawings. - a. The work shall conform to drawings marked "Springfield Dike, Chicopee Town Line to High Ground" as listed below, which drawings form a part of these specifications and are filed in the United States Engineer Office, Providence, Rhode Island.

#### LIST OF DRAWINGS

<u>Sheet No.</u>	<u>Title</u>	<u>File No.</u>
1	Project Location and Index	CT-4-1710
2	Subsurface Explorations	CT-2-1175
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b. The work shall also conform to such other drawings relating thereto as may be exhibited in the office of the contracting officer prior to the opening of proposals and to such drawings used in explanation of details as may be required from time to time during construction, including such minor modifications as the contracting officer may consider necessary on account of conditions discovered during the prosecution of the work.

c. Prior to performing the work, the contractor shall check all drawings and shall immediately report to the contracting officer any errors or omissions discovered therein. Quantities stated in bills of material on contract drawings are approximate only. The contractor shall be responsible for furnishing the required quantity without change in unit price.

d. Ten sets of prints of all necessary drawings will be furnished the contractor without charge. Additional prints will be furnished upon request at the cost of printing.

1-05. Quantities. - The following estimate of quantities is given to serve as a basis for the comparison of bids and to determine the approximate amount of the consideration of the contract. Within the limits



of available funds, the contractor will be required to complete the work specified in Paragraph 1-02, whether the required quantities are more or less than the amounts herein stated.

<u>Item No.</u>	<u>Designation</u>	<u>Unit</u>	<u>Quantity</u>
1	Preparation of Site	acres	3.9
2	Common Excavation	cu.yds.	16,300
3	Removal of Existing Concrete Wall	" "	8
4	Steel Sheet Piling	sq.ft.	37,000
5	Gravel, Pea Stone, and Filter Sand	cu.yds.	2,700
6	Compacted Backfill	" "	7,800
7	Rock Fill	" "	2,500
8	Riprap - Hand Placed	" "	3,800
9	Tile Drains		
	a. 8-inch V.C. Pipe	lin.ft.	750
	b. 8-inch V.C. Pipe (perforated)	" "	380
	c. 12-inch V.C. Pipe	" "	710
	d. 12-inch V.C. Pipe (perforated)	" "	350
10	12-inch Corrugated Metal Pipe (Including Seep Rings and Flap Valve)	job	---
11	Cement	bbls.	3,800
12	Concrete, Class "A"	cu.yds.	2,770
13	Steel Reinforcement	lbs.	217,850
14	Miscellaneous Iron and Steel	"	3,550
15	Copper Water Stops	"	1,000
16	Topsoil	cu.yds.	850
17	Sodding and Seeding	acres	1.05
18	Closing Existing Manhole	job	---

1-06. Physical data. - a. General. - Borings and test pits have been made in the vicinity of the proposed work with reasonable care and substantially at the places indicated on the drawings. Laboratory analyses have been made of the samples from many bore holes and test pits. Samples of materials taken from them and records of laboratory analyses and other studies may be seen at the United States Engineer Office, Providence, Rhode Island. It is expressly understood that the Government will not be responsible for any deduction, interpretation, or conclusions made by the contractor from his inspection of the available samples and records. These samples of materials and contract drawings represent all the pertinent information on subsurface exploration which the Government has made at the site. Concrete aggregates, riprap, and gravel for bedding and drains shall be obtained from approved commercial sources.

b. Transportation facilities. - (1) Railroads. - The New York, New Haven and Hartford and Boston and Maine Railroads serve the cities of Springfield and Chicopee with main and branch line traffic. The contractor shall investigate the availability of the sidings from the railroad company and make all arrangements with the latter for the use of any sidings for the delivery of any materials and equipment to be used on the work.

(2) Highways. - First-class highways also serve the city. The contractor shall provide for his own construction or access roads and their maintenance. He shall make his own investigation of available roads for transportation, of load limits for bridges and roads, and other road conditions affecting the transportation of materials and equipment to the site of the work.

c. Weather conditions. - The locality is subject to atmospheric temperatures ranging from minus 6 degrees to plus 10 $\frac{1}{4}$  degrees Fahrenheit. The mean annual precipitation at Springfield is 43.77 inches. The mean monthly precipitation varies from a low of 3.25 inches in April to a high of 4.27 inches in August.

1-07. Commencement, prosecution, and completion. - a. The contractor will be required to commence the work under the contract within ten (10) calendar days after date of receipt by him of notice to proceed, to prosecute the said work with faithfulness and energy, and to complete the entire work within 120 calendar days after said date of receipt of notice to proceed.

b. Liquidated damages. - In case of failure on the part of the contractor to complete the work within the time determined and agreed upon for its completion plus any extensions duly granted under the terms of the contract, the contractor shall pay the Government as liquidated damages for delay in completing the entire work under the contract, the sum of fifty dollars (\$50.00) for each calendar day until all work is completed or accepted.

1-08. Sundays, holidays, and nights. - No work shall be done on Sundays or on days declared by Congress as holidays for per diem employees of the United States except in cases of emergency, and then only with the written consent of the contracting officer. Work may be done at night when authorized in writing by the contracting officer.

1-09. Progress, organization, and plant. - a. The contractor shall employ at all times, an ample force of men with proper experience in their respective assignments, and provide equipment and a construction plant properly adapted to the work, and of sufficient capacity and efficiency to accomplish the work in a safe and workmanlike manner at the rate of progress specified in his bid. All plant and equipment shall be maintained in good working order, and provision shall be made for immediate emergency repairs. The contracting officer may order the removal and require replacement of any unsatisfactory plant or equipment. No reduction in the capacity of the plant employed on the work shall be made, except under written permission of the contracting officer. The measure of "capacity of the plant" shall be its actual performance on the work to which these specifications apply. It is understood that award of this contract shall not be construed as a guarantee by the United States that the plant and equipment listed by the contractor in the bid form is adequate for the performance of the work.

b. Should the contractor fail to maintain the rate of progress proposed in his bid, the contracting officer may require that additional men, equipment or plant be placed on the work, or a reorganization of the plant layout be effected in order that the work be brought up to schedule and maintained there. Should the contractor refuse or neglect to comply with these requirements to the satisfaction of the contracting officer, the contracting officer will proceed under the provisions of Article 9 of the contract.

1-10. Payments. - Payments will be made monthly in accordance with Article 16 of the contract for work executed and completed as specified or otherwise required, and not included in any prior estimate, except that 10 per cent of the amount of each estimate will be retained until the contract work is 50 per cent completed, and thereafter with each monthly payment there will be paid such portion of the amount so retained as is in excess of 10 per cent of the estimated cost of completing the work remaining to be done, until the amount retained is reduced to \$5,000, after which the amount to be retained will remain unchanged until the completion of the contract.

1-11. Work covered by contract price. - The contractor shall, under his contract prices, furnish and pay for all material and labor, and all permanent, temporary, and incidental work, furnish all accessories, and do everything that may be necessary to carry out the work specified in good faith, which contemplates everything specified completed, of good materials with accurate workmanship, skillfully fitted and properly connected and put together.

1-12. Tax adjustments. - The contract price will be considered to include all Federal, State and local taxes imposed prior to the date of opening bids and applicable to the undertaking. If any privilege, sales, gross receipt or other tax (exclusive of taxes on net income or undistributed profits) applicable to the undertaking and payable directly by the contractor, is imposed or changed after the date of opening bids by Federal or State enactment, then the contract price will be increased or decreased accordingly and any amount due or chargeable against the contractor as a result thereof will be adjusted on payment vouchers as separate items.

1-13. Material to be furnished by the contractor. - The contractor shall furnish all materials and equipment, necessary to complete the work to be done under these specifications. The cost of unloading and loading, handling, hauling, storing and caring for materials furnished by the contractor shall be included in the contract prices for the work to which the materials pertain. All materials, supplies, and articles delivered at the site shall be adequately housed or otherwise protected against deterioration and damage. When material stored at the site and partly paid for is not adequately protected by the contractor, such material will be kept protected by the contracting officer, at the expense of the contractor, and no further partial payments will be made thereon.

1-14. Order of work. - The work shall be carried on at such places and also in such order of precedence as may be found necessary by the contracting officer. The contractor shall submit, for approval of the contracting officer, his proposed program in writing giving the sequence of construction operations contemplated. The location and limits of the work to be done will be plainly indicated by stakes, lines, marks or otherwise as established by the contracting officer or his agents.

1-15. Damage. - Damage to Government property due to the failure of the contractor to take reasonable precaution, and all loss or deterioration of, or damage to any of the work by flood, accident or exposure prior to final acceptance of the work, shall be made good by the contractor without expense to the Government. The Government will compensate the contractor for repairs to the permanent work, if damaged by flooding or scouring through no fault of the contractor (see Paragraph 3-Old(6)).

1-16. Patents. - The contractor shall hold and save the Government, its officers, agents, and employees harmless from liability of any nature or kind, including costs and expenses, for or on account of any patented or unpatented process, or invention, article, or appliance manufactured or used in the performance of this contract, including its use by the Government.

1-17. Grounds and right of way. - a. Grounds and right of way, needed for the work to be done under these specifications, will be furnished by the Government. The Government will not be held liable for any delay in furnishing the grounds or right of way, but in case such delay retards the operations of the contract, the contracting officer will grant an extension of time for the completion of the work equal to the length of the delay. The contractor shall have the privilege of using the Government controlled land at the site, not otherwise reserved by the contracting officer; provided, that plans for all construction, storage, or other operations proposed thereon by the contractor are submitted for approval of the contracting officer, prior to the occupation of such areas.

b. The contractor, without expense to the Government, at any time during the progress of the work and when space is needed for other purposes, shall vacate promptly and clean up any part of the grounds allotted to or in use by him, when directed to do so by the contracting officer.

1-18. Removal of rubbish. - The contractor shall keep the site free from rubbish. Suitable spoil areas for receiving refuse from the grounds shall be provided, and the rubbish shall be removed and disposed of as directed by the contracting officer. At the conclusion of the work, the site shall be cleaned up and all rubbish and unused materials shall be disposed of in accordance with Paragraph 10-03.

1-19. Obstruction and danger lights. - In the contractor's use of streets and highways, for the work to be done under these specifications, he shall conduct his operations so as to cause no greater obstruction to

the traveling public than is considered necessary by the contracting officer. The contractor shall provide, erect and maintain effective barricades, danger signals, and signs on all intercepted roads or highways, and on the site where directed by the contracting officer for the protection of the work and safety of the public. All barricades and obstructions which encroach on or are adjacent to public rights of way and all plant connected with the work, when directed by the contracting officer, shall be provided with lights at night and all such lights shall be kept burning between sunset and sunrise. Such barricades and lights shall conform to the local and State laws. The contractor shall be responsible for all damages resulting from any neglect or failure of these requirements. The expense of these and other safety precautions shall be borne by the contractor.

1-20. Inspection and supervision. - a. General. - The work will be conducted under the general direction of the contracting officer, and will be inspected in accordance with Article 6 of the contract, by inspectors appointed by him. The inspectors so appointed will be authorized to reject material or work which in their opinion does not conform to the requirements of the specifications. Any rejected material shall be removed from the site without delay, and any defective work shall be replaced. The contracting officer will furnish on request of the contractor, all location and limit marks reasonably necessary as provided in Paragraph 1-22. The inspectors will keep a record of work done, and see that the location and limit marks are kept in proper order; work done without proper inspection may not be paid for. The presence of an inspector will not relieve the contractor of his responsibility for the superintendence required in the proper execution of the work (see Article 8 of the contract). Tests to determine the quality and fitness of material used and work done under these specifications will be made as indicated under that part of the specifications pertinent to the particular kind of work, and as stated in Paragraph 1-37.

b. Facilities to be furnished. - (1) The contractor shall furnish promptly, in accordance with Article 6 of the contract, all reasonable facilities, labor, and materials necessary for the safe and convenient inspection and tests that may be required by the contracting officer and his inspectors.

(2) The contractor shall furnish a room approximately 12 by 20 feet in size at his concrete mixing plant for a Government laboratory, to be used for making field tests including the moisture content of aggregates and such other field tests as are prescribed in these specifications under Section VII and for temporary storage of concrete specimens. The room shall be protected from the weather, properly lighted, and heated, all of which together with the location and capacity will be subject to the approval of the contracting officer. The contractor shall provide electricity in accordance with Paragraph 1-34.

(3) The contractor shall furnish appropriate quarters for a Government field office. Such quarters shall be a room approximately 12 by 20 feet in size, and otherwise shall conform to the provisions of subparagraph (2) above.

(4) No separate payment will be made to the contractor for providing these facilities. Should the contractor refuse, neglect, or delay compliance with the requirements concerning facilities for inspection, the specific facilities may be furnished and maintained by the Government, and the cost therefor will be deducted from any amounts due or to become due the contractor.

c. It is hereby understood and agreed that any instructions or decisions by a superior officer through the contracting officer are to be considered instructions or decisions of the contracting officer in all cases under the terms of the contract where decision rests with the contracting officer.

1-21. Datum and bench marks. - The plane of reference used in these specifications and on the drawings hereof is mean sea level datum. Elevations in feet as specified and as shown on the drawings are to be determined from a bench mark located near the site of the work, the location, description, and elevation (in feet) of which is as follows:

W-2 (U.S.C. & G.S.)                      El. 61.591 feet.

At Brightwood, Hampden County, about 111 feet north of the B. & M. R. R. station platform; about 65 feet south of the center line of Wason Ave.; 11.8 feet west of the most westerly rail, and 1.4 feet west of the west edge of a brick wall leading from Wason Ave. to the station. A U.S.C. & G.S. and State Survey standard disk, set in the top of a concrete post. No date.

1-22. Lines and grades. - a. The contractor shall keep the contracting officer informed a reasonable time in advance of the time and places at which he intends to do work in order that lines and grades may be given, necessary measurements for record and payment made and progress photographs taken with a minimum of inconvenience to the contracting officer or of delay to the contractor, and the contractor shall have no claim for damages or extension of time on account of delays in the giving of lines and grades or due to destruction of such marks and the consequent necessity for replacement. Whenever the contracting officer finds it necessary to carry on his operations on Sundays, legal holidays or at other times when the work of the contractor is not in progress, the contractor shall furnish all necessary service and assistance. No direct compensation will be made for the cost to the contractor for any of the work or delay occasioned by giving lines and grades or making other necessary measurements or by inspection, but compensation shall be considered as having been included in the contract prices.

b. All lines and grades will be given by the Government inspectors as authorized representatives of the contracting officer, but the contractor shall provide at his own expense such temporary structures and such materials and give such assistance as may be required by the

contracting officer and the marks given shall be carefully preserved. After lines, elevations and grades for any part of the work have been given by the contracting officer, the contractor will be held responsible for the proper execution of the work to such lines, elevations, and grades, and all stakes or other marks given shall be preserved by the contractor until they are authorized to be removed by the contracting officer. The contracting officer may require the work to be suspended when for any reason such marks cannot be properly followed.

1-23. Interpretation of specifications. - The contracting officer shall decide all questions which may arise as to the performance, quantity, quality, acceptability, fitness, and rate of progress of the several kinds of work to be done or materials to be furnished under this contract. He shall decide all questions which may arise as to the interpretation of the specifications and of drawings used and as to the fulfillment of this contract on the part of the contractor, and as to defects in the contractor's work. His determination and decision shall be final, subject to appeal as provided for in Article 15 of the contract.

1-24. Borrow areas. - Materials for all backfill shall be obtained from the required excavations.

1-25. Water supply. - The contractor shall provide, at convenient points, ample supplies of water of proper quality for all the operations required under this contract.

1-26. Use of explosives. - The contractor shall use the utmost care in the use of explosives necessary for the prosecution of the work, not to endanger life or property. All blasting operations shall be conducted by experienced men only. The handling and use of explosives shall be done strictly in accordance with the latest methods and rulings to insure safety; in accordance with the specifications issued by the United States Bureau of Mines; and in compliance with the local and State laws. Failure to observe necessary precautions will be sufficient grounds for temporary suspension of the work. All explosives shall be transported and stored in a secure manner, and in accordance with local and State laws; all vehicles and such storage places shall be marked clearly "DANGEROUS - EXPLOSIVES," and shall be in the care of competent watchmen at all times. In no case shall caps or other detonators be stored or transported with dynamite or other explosives. The location of magazines for the storage of explosives and for the separate storage of detonators shall be subject to the approval of the contracting officer.

1-27. Standard stock products. - All material, supplies and articles furnished shall, ~~wherever~~ so specified and otherwise wherever practicable, be the standard stock products of recognized reputable manufacturers. The standard stock products of manufacturers other than those specified will be accepted if, in the opinion of the contracting officer, they are equal in strength, durability, usefulness and convenience for the purpose intended. (See Article 7 of the contract.) Any changes required in the details and dimensions shown on the drawings for the sub-

stitution of standard stock products, other than those provided for, shall be properly made as approved by the contracting officer, and at the expense of the contractor.

1-28. Safety requirements. - a. The contractor shall make all necessary provisions to protect the public safety, and to maintain and protect existing structures of whatever kind, and shall repair all damages done to such structures. He shall give ample notification to the proper officials of any city or town and of any public utility or other corporation before entering upon their respective public ways or rights of way to perform the required work of construction. Such construction shall conform to the customary regulations and requirements of said officials or corporations. The contractor shall give all notices, take out all permits, and pay all such charges, fees, water and other rates that may be necessary in the carrying out of the work.

b. The contractor shall be responsible that his employees strictly observe the laws of the United States affecting all operations at the site under the contract. He shall comply with all applicable Federal and State laws under which he is operating, including those concerning the inspection of boilers and other equipment, the licensing of engineers, welders and other employees.

c. The contractor shall conduct the work with due regard to adequate safety and sanitary requirements and shall maintain his plant and equipment in safe condition. He shall conform to current safety engineering practices as set forth in the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America; the publications of the National Safety Council, and with all applicable State or local safety and sanitary laws, regulations and ordinances.

d. The contracting officer will require such safety and sanitary measures to be taken as the nature of the work, and the conditions under which it is to be performed, demand. Such measures shall include:

(1) The provision of adequate extinguishers or fire-fighting apparatus in and about all buildings and plant erected or used at the site of the work.

(2) Adequate first aid and life-saving equipment.

(3) Adequate illumination during night operations.

(4) Instruction in accident prevention to reach all employees.

(5) Such machinery guards, safe walkways, scaffolds, ladders, bridges, gang-planks, and other safety devices, equipment and apparel as are necessary to prevent accidents or injuries.

e. The contractor shall promptly report to the contracting officer in form prescribed by him all accidents occurring at the site of the work.



f. The contracting officer will notify the contractor in writing of any non-compliance with the foregoing provisions and the corrective action to be taken. If the contractor fails or refuses to comply promptly the contracting officer may issue a stop order suspending all or any part of the work. Such stop order will be sent by registered mail to the contractor at the site of the work and shall be accepted by him as sufficient notice thereof. Work shall thereupon be suspended as directed. When satisfactory corrective action is taken, a resumption order will be issued. No part of the time lost due to any such stop order shall be made the subject of a claim for extension of time or for excess costs or damages by the contractor.

1-29. Access to work. - The contracting officer, his authorized representative and other duly authorized agents and employees of the Government may at all times enter upon the work and premises used by the contractor, or into his works, or shops. The contractor shall provide safe and proper facilities for such entrance and for the inspection of materials and workmanship.

1-30. Special wage and labor provisions pertaining to persons employed under the provisions of the Emergency Relief Appropriation Act of 1938. - a. Employment of Relief Labor. - The contractor shall plan his work, and the use of machinery and equipment thereon, so as to provide the maximum employment of relief labor. Relief labor shall be employed as uniformly through the contract period as the status of the work will permit, in the opinion of the contracting officer. Except with the specific authorization of the Federal Works Progress Administrator or his representative, at least 95 per cent of the workers paid from Emergency Relief funds shall be referred for assignment to the work by such public relief agency as may be designated by the Federal Works Progress Administrator or his representative.

b. Labor preferences. - (1) Preference for employment shall be given to persons certified as in need of relief by the public relief agency approved by the Works Progress Administration.

(2) No such person under the age of eighteen (18) years, nor one whose age or physical condition is such as to make his employment dangerous to his health or safety, or the health and safety of others, may be employed under these funds. This paragraph shall not be construed to operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform.

(3) Only one such member of a family group may be employed under these funds, except as specifically authorized by the Works Progress Administration.

(4) No alien is eligible for employment under the W.P.A. program, even though he may have declared his intentions to become a citizen of the United States.

(5) From among those persons certified as in need of relief who are qualified by training, experience and ability, preference in employment shall be given in the following order:

1. Veterans of the World War and the Spanish-American War and veterans of any campaign or expedition in which the United States has been engaged (as determined on the basis of the laws administered by the Veterans' Administration) who are in need and are American citizens.

2. Other American citizens, Indians and other persons owing allegiance to the United States who are in need.

(6) Except as specifically provided above, such workers who are qualified by training and experience and certified for work on the project by such agency as may be designated by the Federal Administrator of the Works Progress Administration, shall not be discriminated against on any grounds whatsoever.

(7) The contractor shall maintain an up-to-date roster of all employees engaged on the project, showing their names, legal residences, and source of employment.

c. Wages and monthly earnings. - (1) The contractor and all subcontractors shall pay all such employees directly employed on this work at the site thereof an hourly rate of pay which shall not be less than the minimum hourly rate of pay as specified in Paragraph 1-35. "The site of the work" as used in these specifications, shall include all operations under this contract or any subcontract, involving labor and materials or labor only, regardless of location, except that operations that are part of the usual and current business of the executor and mingled with other similar work not under this contract shall not be so included. For example, the work of supplying sand and gravel from a pit that is opened up and manned solely for work under this contract is an operation directly on the work.

(2) At least 95 per cent of such employees shall be paid in accordance with the Schedule of Monthly Earnings established by Executive Order No. 7046, dated May 20, 1935, or subsequent revisions thereof, except with the specific authorization of the Federal Works Progress Administrator or his designated representative (see subparagraph (5)).

(3) A clearly legible statement of all wage rates to be paid the several classes of such labor employed on the work shall be posted in a prominent and easily accessible place at the site of the work, and the contractor shall keep a true and accurate record of the hours worked by and the wages paid to each such employee and shall furnish the contracting officer with a sworn statement thereof on demand. All such employees shall be paid in full not less often than once each week and in lawful money of the United States in the full amount accrued to each individual at the time of closing of the payroll, which shall be at the latest date

practicable prior to the date of payment, and there shall be no deductions or rebates on account of goods purchased, rent, or other obligations, but such obligations shall be subject to collection only by legal process.

(4) Wages for any such employees to be paid by, or for which reimbursement is to be made by, the Federal Government may not be pledged or assigned, and any purported pledge or assignment shall be null and void.

(5) The following Schedule of Monthly Earnings is applicable to relief work under this contract (subject to authorized revisions and modifications):

#### SCHEDULE OF MONTHLY EARNINGS

<u>Designation</u>	<u>Hours To Be Worked Monthly</u>	<u>Maximum Monthly Earnings</u>	<u>Computed Wage Rate</u>
Air Tool Operator (Jackhammer)	119	\$ 71.40	\$ 0.60
Blacksmith	77	92.40	1.20
Blaster (Headman)	93	93.00	1.00
Brickmason	57	92.63	1.62-1/2
Carpenter	74	92.50	1.25
Electrician (outside)	68	93.50	1.37-1/2
Fireman	95	71.25	0.75
Hod Carrier (Mason tender)	71	71.00	1.00
Laborer (unskilled)	108	60.48	0.56
Mechanic (Repairman)	93	93.00	1.00
Oiler		not listed	
Powderman Monkey		not listed	
Operators of Large Power Equipment:			
Crane and Derrick	62	93.00	1.50
Dragline	62	93.00	1.50
Shovel	62	93.00	1.50
Operators of Small Power Equipment:			
Compressor (under 400 cu. ft.)	95	71.25	0.75
Compressor (400 cu. ft. or over)	82	71.75	0.87-1/2
Concrete Mixer (under 5 bag)	95	71.25	0.75
Concrete Mixer (5 bag or over)	74	92.50	1.25
Pump	95	71.25	0.75
Tractor (over 40 horsepower)	71	71.00	1.00
Truck (1-1/2 tons and under)	96	60.00	0.62-1/2
Truck (over 1-1/2 tons)	110	71.50	0.65
Reinforcing Rod Placer		not listed	
Ironworker, Structural	68	93.50	1.37-1/2

(6) The normal hours of work for certified employees shall be that number of hours required to earn the authorized monthly wage at the established rate of pay.

d. Delays - Damages. - Any deficiency in the supply of suitably qualified labor to be referred to the work by such agency as may be designated by the Federal Works Progress Administrator may constitute a basis for demand for the modification of this contract as provided in Article 9 as being an "Act of the Government."

e. Compensation insurance. - The contractor shall provide adequate workmen's compensation insurance for all such labor that may come within the protection of such laws and shall provide, where practicable, employers' general liability insurance for the benefits of his employees not protected by such compensation laws, and proof of such insurance satisfactory to the contracting officer shall be given.

f. Dismissal of employees. - Every employer of such persons may dismiss any such employees only with the approval of the contracting officer.

g. Copies of payrolls. - The contractor shall furnish the contracting officer's representative on the work certified legible copies of payrolls, not later than the third day following the payment of wages, for all persons employed by the contractor and each subcontractor at the site of the work as follows:

(1) Two copies of payrolls for all persons assigned through the Works Progress Administration on forms prescribed by the Works Progress Administration. These forms will be supplied by the contracting officer.

(2) Two copies of payrolls for all other employees at the site of the work. These rolls may be prepared on forms regularly in use by the contractor and subcontractors.

h. Subcontractors. - The contractor shall cause appropriate provisions to be inserted in all subcontracts relating to this work for which payment is to be made from funds appropriated by the Emergency Relief Appropriation Act of 1938 to insure the fulfillment of all the provisions contained herein applicable to such funds.

1-31. Purchase of supplies and materials. - a. Preference for domestic articles. - (1) Because the materials listed below or the materials from which they are manufactured are not mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality, their use in the work herein specified (subject to the requirements of the specifications) is authorized without regard to the country of origin:

Platinum	Rubber	Balsa wood
Chromium	Teakwood	English ball clay
Cork	Sisal	English china clay
Jute	Silk	Natural copper-nickel alloy
Kauri gum	Tin	(monel metal)
Lac	Asbestos	
Nickel	China wood oil (tung oil)	

(2) Articles, materials, or supplies, manufactured in the United States and containing mercury, antimony, tungsten, or mica of foreign origin may be used (subject to the requirements of the specifications) in the work herein specified, because such manufactured articles, materials, or supplies have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United States.

b. Purchasing procedure. - Two copies of all purchase orders showing firm names and addresses, and of all shipping bills or memoranda of shipments received showing car initials and numbers, when shipped by railroad, shall be furnished promptly to the contracting officer. Such orders, shipping bills or memoranda shall clearly indicate weights, and shall be so worded or marked that each item, piece or member can be definitely identified on the drawings.

1-32. Minor modifications. - The right is reserved to make such minor changes in the execution of the work to be done under these specifications as, in the judgment of the contracting officer, may be necessary or expedient to carry out the intent of the contract; provided that the unit cost to the contractor of doing the work shall not be increased thereby, and no increase in unit price over the contract rate will be paid to the contractor on account of such changes.

1-33. Protests and appeals. - The Chief of Engineers has been designated by the Secretary of War as his duly authorized representative to make final decision, and to take other action where the terms of the contract require that such decision or action shall rest with "the head of the department concerned or his duly authorized representative." If the contractor considers any work required of him to be outside the requirements of the contract, or if he considers unfair any action or ruling of the inspectors or contracting officer, he shall ask for written instruction or decision from the contracting officer immediately. Any protest based upon such instructions or decision, or claim otherwise arising under the contract, including a request for extension of time under Article 9 of the contract, shall be submitted to the contracting officer within the period specified in the contract. If the contractor is not satisfied with the ruling of the contracting officer he may, where appeal is stipulated in the contract, make written appeal to the Chief of Engineers. Such appeals, containing all the facts and circumstances upon which the contractor bases his claim for relief, shall be addressed to the Chief of Engineers, United States Army, and presented to the contracting officer for transmittal within the time provided therefor in the contract.

1-34. Electric power to be furnished by the contractor. - The contractor shall make arrangements for, shall pay for, and furnish all necessary power to carry on the work, including sufficient power for lighting and other miscellaneous uses in the Government field office. No separate payment will be made to the contractor for the power furnished.

1-35. Rate of wages. - a. In accordance with Article 17 of the contract, the minimum wages shown in the following schedule, as approved by the United States Department of Labor, shall be the minimum rates of wages to be paid by the contractor for work under this contract. Corresponding rates for occupations not listed below will be furnished upon application by the contractor.

<u>Designation</u>	<u>Wage Rate - Hourly</u>
Air Tool Operator (Jackhammer)	\$ 0.60
Blacksmith	1.20
Blaster (Headman)	1.00
Brickmason	1.62-1/2
Carpenter	1.25
Electrician (outside)	1.37-1/2
Fireman	0.75
Hod Carrier (Mason tender)	1.00
Laborer (unskilled)	0.56
Mechanic (Repairman)	1.00
Oilor	0.75
Powderman Monkey	0.60
Operators of Large Power Equipment:	
Crane and Derrick	1.50
Dragline	1.50
Shovel	1.50
Operators of Small Power Equipment:	
Compressor (under 400 cu. ft.)	0.75
Compressor (400 cu. ft. or over)	0.87-1/2
Concrete Mixer (under 5 bag)	0.75
Concrete Mixer (5 bag or over)	1.25
Pump	0.75
Tractor	0.75
Truck (1-1/2 tons and under)	0.62-1/2
Truck (over 1-1/2 tons)	0.65
Reinforcing Rod Placer	1.12-1/2
Ironworker, Structural	1.37-1/2

b. Any class of laborers and mechanics not listed above, which will be employed on the work, will be classified or reclassified by the contracting officer to conform to the foregoing schedule. In the event of disagreement between the contracting officer and the contractor as to such classification or reclassification, the question, accompanied by the recommendation of the contracting officer, will be referred to the United States Department of Labor for final determination.

c. The above list of wages shall be posted by the contractor in a conspicuous place on the work.

1-36. Reports to Department of Labor. - The contractor shall report monthly, and shall cause all subcontractors to report in like manner, within 5 days after the close of each calendar month, on forms to be

furnished by the Department of Labor, the number of persons on their respective payrolls, the aggregate amount of such payrolls, the man-hours worked, and the total expenditures for materials. He shall furnish to the Department of Labor the names and addresses of all subcontractors on the work at the earliest date practicable, provided that the foregoing shall be applicable only to work at the site of the construction project.

1-37. Standard tests, qualities and guarantees. - a. All materials, supplies and parts and assemblies thereof, entering into the work to be done under these specifications, shall be tested as specified, or otherwise required, in conformity with the best modern approved methods for the particular type and class of work.

b. Unless waived in writing by the contracting officer, all tests and trials shall be made in the presence of a duly authorized representative of the contracting officer. When the presence of the inspector is so waived, sworn statements, in duplicate, of the tests made and the results thereof, shall be furnished to the contracting officer by the contractor.

c. Costs of all tests and trials, excepting the expense of the Government inspector and cement, concrete aggregate and cylinder tests, and tests on embankment materials, shall be borne by the contractor and shall be included in the contract price. (See Paragraph 7-11.)

1-38. Protection of existing structures. - During construction operations, on work covered by these specifications, the contractor shall protect all existing structures and accepted work. Any disturbances or damage to any structures by operations under these specifications shall be repaired promptly by the contractor without cost to the Government.

1-39. Final acceptance and payment. - As soon as practicable after the completion of the work the contracting officer will make a thorough examination of same, and if it is found to comply fully with the requirements of the specifications, it will be accepted, and final payment will be made in accordance with Article 16 of the contract.

1-40. Approval. - This contract will be subject to the written approval of the Division Engineer, North Atlantic Division, and shall not be binding until so approved.

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## SECTION II. PREPARATION OF SITE (Item 1).

2-01. Work included. - Clearing, grubbing, and disposal of materials shall be done as directed by the contracting officer, within the limits of the construction area.

2-02. Clearing. - a. The concrete flood wall shall be constructed at the landside toe of an existing earth dike. The large trees, (between 80 and 100), located along the edge of the river; and isolated trees on the river bank shall be removed. All areas within the limits of the construction area shall be cleared when and as directed by the contracting officer. The contractor shall preserve and protect from injury all trees and structures not required to be removed.

b. All timber, undergrowth, brush, logs, weeds, and debris of any nature which in the opinion of the contracting officer are unsuitable for the foundation of the flood walls and riprap shall be removed to such depths and limits as directed by the contracting officer.

2-03. Grubbing. - a. The areas to be grubbed shall include the areas previously cleared, or as may be directed by the contracting officer.

b. All such areas shall be thoroughly grubbed of all stumps, roots, buried logs, and other objectionable matter. Tap roots and other projections over 1-1/2 inches in diameter within the limits of the flood wall foundation, and the surface to be riprapped shall be grubbed out to a depth at least one foot below the ground surface unless otherwise directed by the contracting officer. The root structures, below the water surface, of all trees along the river's edge shall be allowed to remain in place, and shall be covered by the dumped rock toe.

2-04. Removal of structures. - The contractor shall remove a PART of the existing concrete wall near Station 64+00, an old brick tunnel, and a portion of the existing manhole, as specified in Paragraphs 3-04 and 10-02. The removal of other existing structures and utilities required to permit the orderly prosecution of the work covered by these specifications shall be accomplished by local agencies. Whenever a telephone or telegraph pole, pipe line, conduit, fence, sewer or other utility is encountered and must be removed to permit completion of the work, the contracting officer will notify the proper local authorities, and the designated utility will be removed promptly.

2-05. Disposal of materials. - All materials removed, as specified above, shall be disposed of by burning or by removal to approved disposal areas as directed. No material shall be thrown into, or left along the bank of, the river. The disposal of material shall closely follow the operations of clearing and grubbing so that brush and other debris will not be washed into the river in case of high water. At no time shall material be placed on land adjacent to the construction area. No damage of any nature shall be inflicted upon adjoining property owners by unwarranted entry or disposal of material on adjacent property.



2-06. Measurement and payment. - The quantity to be paid for under Item 1 will be the number of acres cleared and grubbed, measured to the nearest tenth of an acre, within the limits of the construction area, as directed by the contracting officer. Payment for all work in connection with the preparation of the site as above specified, including the loading, hauling and disposal of the materials, will be made at the contract unit price for Item 1, "Preparation of Site".

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### SECTION III. EXCAVATION (Items 2 and 3).

3-01. General provisions. - a. Scope of work. - The location and character of the proposed structures, the location and logs of borings, and test pits are shown on the drawings (see Paragraph 1-04). It is the intent of the Government that excavation be made to the lines and grades given thereon but the right is reserved to modify any part of the work if, in the opinion of the contracting officer, conditions require such modification (see Articles 3 and 4 of the contract).

b. Disposal of materials. - (1) Material from the excavations, shall be used, if possible, in the permanent construction as directed by the contracting officer. No material shall be wasted unless specifically authorized by the contracting officer. If, at the time of excavation, it is not possible to place the material in the proper section of the permanent construction, it shall be stock-piled in approved areas for later use. Materials from the excavation that are unacceptable for use in the permanent construction shall be wasted in spoil areas in locations approved by the contracting officer. After completion of all excavation, the spoil areas shall be neatly dressed, smoothly graded, sloped for drainage and left in a sightly condition, all as directed by the contracting officer.

(2) Topsoil and sod may be obtained from the trimming operations on the river bank and the required excavation of the existing dike, and shall be stock-piled in approved locations to be used later on the berm adjacent to the wall, unless otherwise authorized by the contracting officer.

c. Measurement. - (1) Excavation for structures will be measured in place and the volume thereof will be computed between the original ground surface as determined by a survey made just prior to the commencement of the work and the pay lines shown on the drawings.

(2) Where pay lines are not shown on the drawings, measurement will be made of the volume between the original surface as determined from the survey made just prior to the commencement of the work and the lines and grades established by the contracting officer.

d. Payment. - (1) Items included. - The contract prices for the various classes of excavation shall include the cost of all labor, plant and incidental costs, for excavating, loading, hauling and disposal of the material as backfill or in spoil areas, including any stock-piling and rehandling.

(2) Construction roads. - The cost of construction and maintenance of roads and bridges for the contractor's use will not be paid for under a separate item in the contract but shall be included in the prices bid for the other items of work.

(3) Pay lines. - Payment for all structure excavations will

be made to the pay or slope lines shown on the drawings regardless of whether or not it is necessary to remove the material to slopes greater or less than those shown. No payment will be made for excavation outside of the limits described above; the contractor will be required to backfill any such excess excavation with approved material, or with concrete where excavated surfaces are to be in contact with concrete structures, at his own expense.

(4) Shoring. - Timber sheeting shall be used where shown on the drawings. Where approved by the contracting officer, timber sheeting or shoring may be used in lieu of excavation to the slope or pay lines shown on the drawings. The contractor shall be responsible for the unfinished work, and that workmen shall be safe from danger of caving or slides while making structure excavations. If shoring is necessary and the contractor does not use it, its use will be ordered by the contracting officer. Shoring shall be erected in a safe and workmanlike manner, and shall be placed in such a way as to afford ready inspection and ample clearance for the permanent work. Shoring shall be removed upon completion of the permanent work as soon as the construction does not require its use. No payment will be made for timber sheeting or shoring whether used in lieu of excavation or whether used where shown on the drawings but the cost thereof shall be included in the contract unit price for the excavation.

(5) Temporary drains. - The contractor shall maintain the site of the work and adjacent grounds in a well drained condition. Temporary drains and ditches required shall be constructed by the contractor at his own expense.

(6) Additional payments. - Additional payment will be made to replace portions of the river bank and existing dike washed out by flooding or scouring, or that required to be removed on account of slides, or the removal and disposal of all objectionable materials; provided such replacement of material was not caused by negligence or carelessness of the contractor. Quantities for additional payment will be measured as directed by the contracting officer, and payment will be made at the applicable contract prices.

3-02. Classification. - All materials excavated will be classified as follows:

- a. Common Excavation (Item 2) (See Paragraph 3-03).
- b. Removal of Existing Concrete Wall (Item 3) (See Paragraph 3-04).

3-03. Common excavation. (Item 2). - a. Work included. - The contractor shall excavate and dispose of the materials classified as common excavation above and below the mean water level in the river to the lines and grades shown on the drawings for the respective areas, or as otherwise directed by the contracting officer. Excavation shall be performed in accordance with a schedule of operations to be approved

by the contracting officer. Common excavation includes stripping and excavation for the foundation of the concrete flood wall and grading of the river bank additional to that included under Item 1, and any other required common excavation for structures, drains and ditches not included in other items of the work. The necessary excavation of the road bed of Plainfield Street shall be included under Item 2. The material shall be stock piled for use as back fill (See Paragraph 5-03a.)

b. Description. - Excavations shall be made wide enough to permit proper sheeting, bracing and form work where necessary. Foundations for the concrete flood wall shall be excavated as directed by the contracting officer to suitable undisturbed foundation material approved by the contracting officer, through any poorly compacted or otherwise unsuitable material encountered in the construction operations. The additional depth of excavation shall not in general, exceed 5 feet below the elevation of the concrete footing of the flood wall. Special precaution shall be taken at the old brick sewer near Station 78+35. Excavation shall be done as shown on the drawings; the cost of removal of brick shall be included under Item 2. Payment for placing and compacting the backfill will be made under Item 6 (See Paragraph 5-03d).

c. Shoring. - See Paragraph 3-01d(4).

d. Sheeting and pumping. - The contractor shall provide all necessary pumps to unwater the site properly and to keep the site free of water during such time as the work is under construction. The contractor shall provide all labor and materials required to keep the site unwatered during the course of construction, and shall provide all necessary bulkheads, drains, etc., to prevent running water from coming in contact with newly placed concrete or concrete being placed in excavated areas.

e. Disposal of materials. - The provisions of Paragraph 3-01b shall apply. Excavated materials not used in permanent construction may be used in temporary construction if approved by the contracting officer.

f. Measurement and payment. - Measurement for excavation work under Item 2, "Common Excavation" will be made in accordance with Paragraph 3-01c. Payment for all work in connection with excavation under Item 2, including the loading, hauling, and disposal of the materials, temporary protection, bulkheads and drains, unwatering and shoring, will be made at the contract unit price for Item 2, "Common Excavation".

3-04. Removal of existing concrete wall. (Item 3), - a. (1)  
Work included. - The contractor shall excavate and dispose of the materials in the existing concrete wall near Station 84+00, as shown on the drawings. The concrete fragments shall be broken to sizes suitable for use as rock fill under Item 7 (See Paragraph 5-04). Some stock-

piling may be necessary.

(2) The removal and backfill of the old brick tunnel will be paid for under Items 2 and 6 as applicable.

b. Blasting. - (1) Blasting and the use of explosives shall be conducted as provided for in Paragraph 1-26.

(2) Blasting will be permitted only when proper precautions are taken for the protection of all persons, the work and the property. All damage done to the work or the property shall be repaired at the contractor's expense. All operations of the contractor in connection with the transportation, storage, and use of explosives shall be as approved by the contracting officer.

(3) Explosives of such quality and power shall be used in the locations which will, in the opinion of the contracting officer, neither crack nor damage the work outside the lines of excavation. Blasting shall be done only to the lines and grades shown on the drawings or approved by the contracting officer.

(4) Approval by the contracting officer of the method of blasting or the strength and amount of the explosive used, will not relieve the contractor of his responsibility in the blasting operations.

c. Disposal of materials. - As directed by the contracting officer all suitable materials excavated under Item 3 shall be placed in the rock fill toe on the river bank (See Paragraph 5-04). Excavated materials not used in such construction shall be disposed of in designated spoil areas as provided in Paragraph 3-01b.

d. Measurement and payment. - The quantity to be paid for under Item 3 will be the number of cubic yards excavated and satisfactorily disposed of in accordance with the drawings or as directed. Measurement will be made to the neat lines of the structure, before removal. Payment for all work in connection with excavation under Item 3, including the loading, hauling, stock-piling, rehandling, and disposal of the materials, will be made at the contract unit price for Item 3, "Removal of Existing Concrete Wall".

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#### SECTION IV. STEEL SHEET PILING (Item 4).

4-01. Work included. - The contractor shall construct the steel sheet-piling cut-off under the concrete flood wall as shown on the drawings. The cut-off shall be constructed of piles of varying lengths including specials, driven to grade, between the limits as shown on the drawings.

4-02. Type and properties. - The piles shall be of the arch web type and shall have a minimum thickness of metal of  $3/8$  inch, except that a reasonable reduction for shaping the joints of the interlock will be permitted. The piles shall provide a section modulus of not less than 5.4 inches cubed per linear foot of cut-off, and shall weigh not less than 22 pounds per square foot of cut-off, exclusive of any welded or riveted connection or reinforcement. The interlocked joints shall develop a strength in direct tension of not less than 8,000 pounds per linear inch of interlock without rupture. The piles shall be continuously interlocked throughout their entire length and shall be provided with standard pulling holes located as shown on the drawings. The type and dimensions of the piles the contractor proposes to furnish shall be submitted to the contracting officer for approval before any piles are delivered to the work.

4-03. Materials. - Steel for sheet piling shall conform to Federal Specification QQ-S-751a for "Steel: Structural (Including Steel for Cold Flanging) and Steel: Rivet (for) Ships other than Naval Vessels", Structural Grade, except for the following requirements:

(1) Tensile Strength shall be not less than 70,000 pounds per square inch, except that fabricated sections such as corner piles, tee piles and other special sections shall be of steel having a tensile strength of not less than 60,000 pounds per square inch.

(2) Elongation in 8 inches, minimum  $1,400,000$   
tensile strength

(3) Bend Test Specimens shall withstand bending 180 degrees around a pin with a diameter twice the thickness of the specimen without fracture on the outside of the bend.

4-04. Driving. - The piles shall be driven to form a continuous interlocking diaphragm down to the elevation established for the bottom of the cut-off, as shown on the drawings. Special care shall be taken to avoid damage to sewers encountered in the work. A protecting cap shall be used in driving. The hammers shall be of a suitable size and type, either steam or air operated. The use of a water jet may be permitted at the discretion of the contracting officer. Piles shall be driven without injury to them, as true to line and grade as possible, and shall be cut off, where necessary, to the top elevation of the sheet-piling cut-off as shown on the drawings. Proper precautions shall be taken to prevent rupture at the interlocks. Piles ruptured

at the interlock or otherwise injured shall be removed and replaced by new piles at the contractor's expense. Special sections, including tees, corners and wedges, shall be installed at locations where, in the opinion of the contracting officer, such sections are necessary to insure proper construction of the sheet-piling cut-off.

4-05. Measurement and payment. - The quantity of steel sheet piling to be paid for will be the number of square feet of sheet piling actually in place as specified below the top elevation of the sheet-piling cut-off. Payment will be made at the contract unit price for Item 4, "Steel Sheet Piling", and shall include the costs of all labor, materials, equipment and incidentals required to construct the sheet-piling cut-off as specified.

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SECTION V. MISCELLANEOUS FILL AND BACKFILL (Items 5 to 7 incl.)

5-01. Definitions. - Gravel bedding will be required immediately underlying the riprap as shown on the drawings. "Pea-Stone and Filter Sand" are the materials immediately underlying the gravel in the filters in back of the concrete wall north of Station 88+98. "Compacted backfill" is generally structure backfill at the flood wall and other structures as shown on the drawings. "Rock fill" refers to dumped rock fill for the rock toe on the river bank.

5-02. Gravel, Pea-Stone and Filter Sand (Item 5). - a. Work included. The contractor shall place, in the locations shown on the drawings or as directed by the contracting officer, a layer of gravel upon which riprap will be placed. The contractor shall also place a layer of gravel of the specified quality required for filters at the locations shown on the drawings or as directed by the contracting officer.

b. Materials. - (1) Gravel shall consist of suitable coarse clean gravel of which, unless otherwise directed, not more than ten per cent by weight will pass a No. 10 sieve. The gravel shall all pass a 2-inch square mesh screen and shall be satisfactorily graded.

(2) Pea stone for filters shall consist of suitable clean hard particles of which, unless otherwise directed, not more than ten per cent by weight shall pass a No. 10 sieve. The particles shall all pass a 3/8-inch square mesh screen and shall be satisfactorily graded. Approximately 20 cubic yards of pea stone will be required.

(3) Sand for filters shall consist of suitable clean hard particles of which unless otherwise directed not more than ten per cent shall pass a No. 50 sieve. The particles shall all pass a No. 10 sieve and be satisfactorily graded. Approximately 30 cubic yards of sand will be required.

(4) The materials in subparagraphs (1), (2) and (3) above shall be obtained from approved commercial sources or stockpiles (see Paragraph 3-01b), be screened, and placed directly in position and consolidated by wetting to the extent directed.

c. Placing. - The materials shall be placed as shown on the drawings or as directed, and with such hand-placing as may be necessary. The contractor will not be required to tamp or roll the material, but will be required to consolidate it with water to the extent directed so that no settlement or voids will later result.

d. Measurement and payment. - The quantity to be paid for under Item 5 will be the number of cubic yards of the materials required placed to the limits shown on the drawings, or ordered. Payment will be made at the contract unit price for Item 5, "Gravel, Pea Stone and Filter Sand" (see Paragraph 1-05).



5-03. Compacted backfill (Item 6). - a. Work included. - The contractor shall place, grade and consolidate materials required for backfill at the flood wall and at other concrete structures, and on the river bank as directed. The material excavated within the limits of Plainfield Street shall be stockpiled and used for backfill of Plainfield Street on the landside of the concrete wall.

b. Borrow. - Materials shall be borrowed from stock-piles of excavated materials (see Paragraph 3-01b), or may be obtained directly from required excavations. Backfill material shall be free from stumps, roots, sod, rubbish or other unsuitable materials or substances.

c. Placing. - The backfills shall consist of materials suitable for the purpose in the opinion of the contracting officer, and shall be placed in successive layers of not more than 12 inches in depth for the full width of the cross section. Each layer shall be compacted thoroughly with a crawler type tractor weighing not less than 20,000 pounds. A minimum of four passes of the tractor treads on each square foot of backfill area will be required for satisfactory compaction. Portions of the backfill area which the compacting equipment cannot reach for any reason shall be thoroughly compacted by tamping with hand or power tampers in 2-inch layers. The degree of compaction for such portions of the backfill shall be equivalent to that obtained by compacting with tractor equipment. Special precautions shall be taken at the backfilling of the demolished brick sewer near Station 78+35, and over the existing 72-inch sewer near Station 81+00, where hand tamping will be necessary (see Paragraphs 3-03 and 10-02).

d. Measurement and payment. - Measurement will be made by the cubic yard for the amount of compacted backfill placed in the completed work to the lines and grades shown on the drawings or as directed by the contracting officer. Quantities will be measured in place after any settlement. Payment for all work in connection with furnishing and placing compacted backfill will be made at the contract unit price for Item 6, "Compacted Backfill".

5-04. Rock fill (Item 7). - a. Work included. - (1) The contractor shall furnish all equipment and labor required to construct the dumped rock fill on the slope of the river bank. The rock fill shall be to the limits shown on the drawings or as directed by the contracting officer.

(2) The contractor shall do all the preliminary grading and other incidental work, not included in any other item, required to prepare the site for the rock fill.

b. Material. - (1) Rock fill shall be composed of durable stone or concrete fragments of acceptable sizes. Suitable rock, boulders, large cobbles, and concrete fragments from the required excavations (see Paragraph 3-04), may be used. The rock fill shall be constructed of the thickness and the extent shown on the drawings or directed. The average

surface of the rock fill shall satisfactorily approximate the required theoretical. The contractor need not place rock fill by hand, except to rearrange surface stones as necessary to fill unsatisfactory depressions in the surface below the required grades. The rock shall be carefully dumped in place with the larger rocks at the outer faces and the smaller rocks and spalls adjacent to the river bank. The rock fill shall consist of fragments of stone or concrete of which none shall be smaller than one cubic foot and of which those exceeding one-half cubic yard shall constitute at least 50 per cent of the volume, except as otherwise authorized by the contracting officer.

(2) Generally the maximum allowable size of single pieces of rock or concrete shall be 1 cubic yard. A tolerance of 6 inches above or below the slope line shown on the drawings will be allowed for the finished slope surfaces of the rock fill.

c. Measurement and payment. - The quantity to be paid for under Item 7 will be the number of cubic yards of rock fill satisfactorily placed to the specified lines or grades in the completed work. Payment will be made at the contract unit price for Item 7, "Rock Fill". The contract unit price shall include payment for all materials, equipment, labor and incidentals required to construct and trim the rock fill.

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SECTION VI. RIPRAP AND DRAINS (Items 8 to 10 incl.)

6-01. General. - "Riprap - Hand Placed," Item 8, will be required on the river-bank as shown on the drawings or as directed by the contracting officer. "Tile Drains", Item 9, will be required for the drainage system, and "12-Inch Corrugated Metal Pipe", Item 10, will be required for temporary drainage through the dike as shown on the drawings or as directed by the contracting officer.

6-02. Riprap - hand placed (Item 8). - a. Work included. - Riprap shall be placed, to the lines and grades shown on the drawings, on the river bank and elsewhere as required by the contracting officer.

b. Material and placing. - Riprap shall be of durable rock of acceptable sizes with a specific gravity of not less than 2.65. The riprap shall be laid to the lines and grades shown on the drawings or as directed. A tolerance of 3 inches above or below the slope line shown on the drawings will be allowed for the finished slope surface of the hand-placed riprap. Rock for riprap shall be angular and of uniform shape so as to furnish an even, reasonably smooth surface. Not more than 5 per cent by weight of the rock shall be smaller than one-half cubic foot in volume and at least 75 per cent of the rock used shall be from 1 to 2 cubic feet in volume with one dimension approximately equal to the depth of the riprap course. The rock shall be closely laid on gravel bedding (see Paragraph 5-02), with the dimension normal to the slope approximately equal to the depth of the riprap, and with joints broken where possible. The joints on the surface of the riprap shall be filled with tightly driven spalls. Large rock shall be well bedded at the edges of the riprap to prevent undermining.

c. Measurement and payment. - (1) The quantity to be paid for under Item 8 will be the number of cubic yards of riprap satisfactorily placed in the completed work to the specified or ordered lines and grades. Payment will be made at the contract unit price for Item 8, "Riprap - Hand Placed", which shall include all costs for furnishing, hauling and placing the riprap.

(2) Removal of the existing riprap to allow construction of the temporary drain near the site of the proposed pumping station will be paid for as excavation under Item 2 (see Paragraph 3-03). Payment for replacing the riprap will be made at the contract unit price for Item 8.

6-03. Tile drains (Item 9). - a. Work included. - The contractor shall furnish and lay tile pipes of the required diameters for the drainage system on the landside of the concrete flood wall as shown on the drawings.

b. Materials. - All pipes shall be bell-and-spigot, vitrified, clay pipe conforming to the requirements of Federal Specification SS-P-361, or subsequent amendments or revisions thereof. Each pipe shall be carefully inspected immediately before laying and no cracked, broken or other-

wise imperfect pipe shall be used, except for minor defects which in the opinion of the contracting officer do not impair the fitness of the pipe for the purpose intended.

c. Excavation. - Excavation shall be done as shown on the drawings and as provided for in Paragraph 3-03.

d. Laying pipe. - All pipe shall be placed in the trench immediately after the excavation is completed, and the gravel filter is placed as shown on the drawings. Proper care shall be used in handling the pipe to avoid injury or breakage. The pipe shall be carefully bedded, and properly connected and jointed. Bell holes shall be excavated to insure that each pipe shall rest firmly upon its bed for the entire pipe length. The pipes shall be laid with open joints true to the lines and grades shown on the drawings or as staked in the field, with bells upgrade and with spigot ends fully entered in the bells. Every third pipe shall be perforated. A strip of burlap at least 6 inches in width and 36 inches in length shall be carefully and securely wrapped around the pipe joints.

e. Backfilling. - Backfill material as shown on the drawings shall be evenly spread and compacted around and over the pipe to the limits shown on the drawings or as directed by the contracting officer (see Paragraph 5-02).

f. Measurement and payment. - (1) Measurement for payment will be based on the linear feet of pipe of the sizes installed. Payment for pipe will be made at the applicable contract unit prices for Items 9, (a) to (d), "Tile Drains", which shall include all costs of furnishing and installing the pipe, except the cost of excavation and backfilling (see Paragraph 1-05).

(2) Payment for excavation will be at the contract unit price for Item 2 (see Paragraph 3-03). Payment for backfilling will be made at the contract unit price for Item 5 (see Paragraph 5-02d), or at the contract unit price for Item 6 (see Paragraph 5-03d), as applicable.

g. Alternate. - Perforated corrugated metal pipe or perforated concrete pipe may be substituted for V.C. tile pipe of the sizes specified if approved by the contracting officer.

6-04. 12-Inch corrugated pipe (Item 10). - a. Work included. - The contractor shall furnish and lay 12-inch diameter galvanized corrugated metal pipe, required for temporary drain through the existing dike, including seep rings and flap valve as shown on the drawings.

b. Materials. - All pipe shall meet the requirements of Federal Specification QQ-C-806, as amended March 1936. No pipe sections will be accepted unless the metal is identified by a stamp showing name

of manufacturer, name of plant, kind of base metal and gage number. The flap valve shall be a "Model 100, Calco Automatic Drainage Gate, or approved equal.

c. Excavation. - Excavation shall be done as shown on the drawings and as provided for in Paragraph 3-03. The trench shall have a width of 24 inches greater than the outside diameter of the pipe. The bottom of the trench throughout its length shall be carefully formed to fit the circular shape of the pipe, so that the pipe shall be firmly supported on the bottom and for at least 3 inches up each side. All rock or boulders shall be removed to a depth of 6 inches below the bottom grade of the trench and the voids backfilled with well compacted suitable material.

d. Laying pipe. - The pipe shall be placed in the trench immediately after the excavation is completed. Proper care shall be used in handling the pipe to avoid injury. The pipe shall be carefully bedded, and properly connected and jointed. The pipe shall be laid true to the lines and grades and with the camber shown on the drawings. The interior of the pipe shall be carefully cleaned after laying, of all dirt and other obstructions.

e. Backfilling. - Backfill material shall be evenly spread and compacted under and around the pipe. Backfill over the pipe shall be done in accordance with the provisions of Paragraph 5-03, unless otherwise shown on the drawings or directed by the contracting officer.

f. Payment. - (1) Payment will be made at the contract lump sum price for Item 10, "12-Inch Corrugated Metal Pipe", and shall include all costs of furnishing and installing the pipe, seep rings and flap valve, except the cost of excavation, backfilling, and any concrete required.

(2) Payment for excavation will be made at the contract unit price for Item 2 (see Paragraph 3-03). Payment for backfilling will be made at the contract unit price for Item 6 (see Paragraph 5-03). Payment for concrete will be made at the contract unit price for Item 12 (see Paragraph 8-03).

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## SECTION VII. CONCRETE (Items 11 to 13 incl.)

### COMPOSITION, CLASSIFICATION AND STRENGTH

7-01. Composition. - Concrete shall be composed of cement, fine aggregate, coarse aggregate and water so proportioned and mixed as to produce a plastic, workable mixture in accordance with all requirements under this section and suitable to the specific conditions of placement.

7-02. Classification. - All concrete shall be Class "A".

7-03. Strength. - The mixes will be designed to secure concrete having at least the following compressive strength at the age of 28 days, as determined by breaking standard 6-inch diameter by 12-inch height or 8-inch diameter by 16-inch height test specimens:

<u>Class</u>	<u>Average for any 25 consecutive cylinders</u>	<u>Minimum for any one cylinder</u>
A	3400 lbs. per sq. in.	2600 lbs. per sq. in.

7-04. High-early-strength-concrete. - High-early-strength concrete made with high-early-strength Portland cement or other special cements shall be used only when specifically authorized by the contracting officer. The 7-day compressive strength of concrete of any class, when made with high-early-strength cement, shall be at least equal to the specified minimum 28-day compressive strength for that class. All provisions of these specifications, except for cement, shall be applicable to such concrete. Any high-early-strength cement used shall be approved by the contracting officer before use.

### MATERIALS.

7-05. Portland cement (Item 11). - a. The contractor shall furnish Portland cement of the quality herein specified in sufficient quantity for the work required. Cement for all concrete, grout and mortar, except as specified in Paragraph b, shall conform to Federal Specification SS-C-206, for "Cement, Portland, Moderate-Heat-of-Hardening, September 30, 1936", except that Paragraph E-7, Heat of Hydration, shall be considered inoperative.

b. High-early-strength Portland cement. - Cement for high-early-strength concrete shall be in accordance with Federal Specifications SS-C-201, for "Cement, Portland, High-Early-Strength".

c. Special test requirements. - Cement will be tested by the Government at the Central Concrete Laboratory, West Point, New York. No cement shall be used until notice has been given by the contracting officer that the test results are satisfactory. Cement which has been

stored, other than in bins at the mills, for more than 4 months after being tested shall be retested before use. Ordinarily, no cement shall be used until after it has satisfactorily passed both the 7 and 28-day tests, but in cases of emergency the contracting officer may waive the 28-day tests and permit the use of cement which has satisfactorily passed the soundness and 7-day tests; provided it is the product of a quarry and mill having established a reputation of not less than 3 years' standing, for the production of high-grade cement. If the tests prove any cement unsatisfactory which has been delivered at the site of the work, such cement shall be promptly removed from the work and its vicinity.

d. Identification. - Cement shipped in bags shall be identified by marking or tagging the bags with the identifying number or symbol of the Federal Specifications under which it was manufactured. Bulk shipments of cement shall be likewise identified by a suitable device affixed to each car or other type of bulk carrier. Marking or tagging shall be done at the mill.

e. Quality and packages. - All cement shall be dry, finely ground and free from lumps or caking. Unless otherwise permitted, the cement shall be delivered in canvas bags or other strong, well-made packages, each plainly marked with the manufacturer's brand. The weights of such bags shall be uniform. Packages received in broken or damaged condition will be rejected or accepted only as fractional packages. Cement shall be stored in a satisfactory manner so as to be unaffected by moisture, keeping each carload separate until the results of the 28-day tests are known. Suitable accurate scales shall be provided by the contractor for weighing the cement.

f. Records of cement used. - The contractor shall furnish to the contracting officer, at the end of each day's work, a statement showing in such detail as he may reasonably require the quantity of cement used during the day at each part of the work.

7-06. Fine aggregate. - a. Composition. - Fine aggregate shall be natural sand.

b. Quality. - Fine aggregate shall consist of hard, strong, durable and uncoated particles.

c. Grading. - (1) Except as provided in (2) below fine aggregate shall conform to the following requirements:

Total passing -	Per cent by weight
No. 4 sieve	95 - 100
No. 16 sieve	45 - 75
No. 50 sieve	10 - 25
No. 100 sieve	1.5 to 7

(2) Deficiencies in the percentages of fine aggregate passing the #50 and #100 sieves, as required in the above gradation, may be remedied by the addition of pozzuolanic or cementitious materials, excepting Portland cement; provided, at least 5 per cent passes the #50 sieve and the aggregate is of proper consistent gradation within the specified limits. Such added material, which will be considered and included as fine aggregate, shall conform to the requirements in Paragraph 7-08 and shall be in sufficient quantity to meet the minimum requirements above for percentage passing the #100 sieve and otherwise to produce the workability required by the contracting officer. The quantity and characteristics of any material used for the purpose of correcting workability shall be such that when the concrete is gaged to the proper consistency the total water content shall not exceed by more than 1 gallon per cubic yard the minimum quantity required for proper consistency when not using the admixture. The blending of any material with the original naturally graded sand to remedy deficiency in gradation shall be accomplished in charging the mixture, unless otherwise specifically authorized by the contracting officer.

d. Deleterious substances. - The substances designated shall not be present in excess of the following amounts:

	Per cent by weight
Clay lumps	1
Material removed by decantation from aggregates not more than	3
Shale	0.5

e. Mortar strength. - Mortar specimens made with the fine aggregate shall have a compressive strength at 28 days of at least 90 per cent of the strength of similar specimens made with Ottawa sand having a fineness modulus of 2.40+ 0.10 and the same cement.

f. Tests. - Fine aggregate shall be subject to careful, thorough analyses, including magnesium sulphate soundness tests (see Paragraph 7-07d), to determine conformity with all requirements of these specifications.

7-07. Coarse aggregate. - a. Composition. - Coarse aggregate shall be washed gravel or crushed stone.

b. Quality. - Coarse aggregate shall consist of hard, tough and durable particles free from adherent coating. It shall contain no vegetable matter nor soft, friable, thin or elongated particles in quantities considered deleterious by the contracting officer. The substances designated shall not be present in excess of the following amounts (by weight):

Soft fragments	5%
Clay lumps	1/1%
Removed by decantation	1%



When the material removed by decantation consists essentially of crusher dirt the maximum amount permitted may be raised to 1-1/2 per cent. Aggregate which has disintegrated or weathered badly under exposure conditions similar to those which will be encountered by the work under consideration, shall not be used. When crushed stone is used the crusher shall be equipped with a screening system which will entirely separate the dust from the stone and convey it to a separate bin.

c. Size. - (1) Coarse aggregate shall be well graded from fine to coarse so that concrete of the required workability, density, and strength can be made without the use of an excess amount of sand, water, or cement.

For Class "A" concrete, the maximum size mesh screen for the aggregate shall be 1-inch.

(2) The grading of the coarse aggregate, in the mixed concrete, shall fall within the following limits:

	(Per cent by weight) (Passing)
Maximum size mesh screen (square mesh)	97 - 100
1/2 maximum size mesh screen (square mesh)	40 - 70
No. 4 sieve	0 - 6

d. Tests. - Coarse aggregate will be subjected to freezing and thawing tests and to careful, thorough analyses to determine conformity with all requirements of these specifications. Coarse aggregate will be subjected to 10 cycles of the magnesium sulphate test for soundness. No aggregate shall be used which develops a loss in excess of 10 per cent by weight.

7-08. Material added for workability. - a. The use of any material added to the mix to improve workability (see Paragraph 7-06c(2)), which, in the opinion of the contracting officer, may have an injurious effect on the strength, density, and durability of the concrete, will not be permitted. Before approval of any material, the contractor will be required to submit the results of complete chemical and sieve analyses made by an acceptable testing laboratory. Subsequent tests will be made of samples taken by the contracting officer from the supply of the material being used on the work to determine whether it is uniform in quality with that approved.

b. The material added shall be pozzuolanic, cementitious or silicious. It shall not contain effective early-heat-producing elements nor compounds, such as those contained in Portland cement, nor shall its use result in a material increase in the free-lime content of the concrete. It shall also be in conformity with the following requirements:

Free moisture - a total of not more than 3 per cent by weight.  
Passing #30 sieve - not less than 100 per cent by weight.  
Passing #200 sieve - not less than 85 per cent by weight.

7-09. Water. - The water used in mixing concrete shall be fresh, clean and free from injurious amounts of oil, acid, alkali, or organic matter.

7-10. Storage. - a. Cement. - Immediately upon receipt, at the site of the work, cement shall be stored in a thoroughly dry, weather-tight, and properly ventilated building with adequate provisions for the prevention of the absorption of moisture. The building shall be of adequate capacity to provide for the requirements of delivery and construction schedules. Storage shall be such as to permit easy access for inspection and definite identification of each shipment.

b. Aggregates. - The fine and coarse aggregates shall be stored separately (see Paragraph 7-07c(2)) and in such manner as to avoid the inclusion of any foreign material in the concrete. Stock-piles of coarse aggregates shall be built in horizontal layers to avoid segregation.

7-11. Sampling and testing aggregates. - Except where provided otherwise by these specifications, all sampling and testing of aggregates shall be made in accordance with the Federal Specifications. Unless specified otherwise, all test samples shall be taken under the supervision of the contracting officer and supplied to the Central Concrete Laboratory, West Point, New York, by the contractor at his expense. The source from which concrete aggregates are to be obtained shall be selected by the contractor well in advance of the time when they will be required in the work, and suitable samples as they are to be used in the concrete shall be furnished to the contracting officer at least 30 days in advance of the time when the placing of the concrete is expected to begin. The contractor shall obtain fine and coarse aggregates for concrete from approved commercial sources.

#### PROPORTIONING, MIXING AND PLACING

7-12. Proportioning. - a. Basis. - All concrete materials will be proportioned so as to produce a workable mixture in which the water content will not exceed the maximum specified.

b. Control. - The exact proportions of all materials entering into the concrete shall be as directed by the contracting officer. The contractor shall provide all equipment necessary to positively determine and control the actual amounts of all materials entering into the concrete. The proportions will be changed whenever in the opinion of the contracting officer such change becomes necessary to obtain the specified strength and the desired density, uniformity and workability, and the contractor will not be compensated because of such changes.

c. Measurement. - All materials shall be measured by weight except that water may be measured by volume when so authorized by the contracting officer. One bag of cement will be considered as 94 pounds in weight and 1 gallon of water as 8.33 pounds.

d. Cement content. - Each cubic yard of concrete shall contain not less than the quantity of cement stated below:

Class "A" - 5.5 bags or 517 pounds.

For concrete deposited in water the minimum cement content shall be 6.5 bags or 611 pounds of each cubic yard of concrete in place.

e. Water content. - (1) In calculating the total water content in any mix the amount of moisture carried on the surface of the aggregate particles shall be included. The total water content for a bag of cement for each batch of concrete shall not exceed the following:

Class "A" - 5.5 gallons or 45.8 pounds.

Class "B" - 6.5 gallons or 54.1 pounds.

In all cases, however, the amount of water to be used shall be the minimum amount necessary to produce a plastic mixture of the strength specified and of the desired density, uniformity and workability. In general, the consistency of any mix shall be that required for the specific placing conditions and methods of placement, and ordinarily the slump shall be between 1 inch and 3 inches when tested in accordance with the current specifications for "Method of Test for Consistency of Portland Cement Concrete," of the American Society for Testing Materials.

(2) An increase in the maximum water content, based only on the requirements of materials added in accordance with Paragraph 7-06c to improve workability will not be permitted unless comparative tests under job conditions show conclusively that such increase in water content will not result in a decrease in concrete strength and provided further that such increase does not exceed 1 gallon per cubic yard.

f. Aggregate content. - The total volume of aggregates to be used in each cubic yard of concrete shall be that necessary to produce a dense mixture of the required workability as determined by the contracting officer.

7-13. Mixing and placing. - a. Equipment. - Concrete shall be mixed in approved mechanical mixers of a rotating drum type, except that if permitted relatively small quantities may be mixed by hand in a satisfactory manner. Concrete shall be mixed at all times by competent and experienced men. The contractor shall provide at the site of the work a modern and dependable batch type mixing plant with a minimum capacity of 100 cubic yards of concrete per 8 hours. The plant shall include not fewer than two complete mixers with separate power plants, hav-

ing a minimum capacity of  $1\frac{1}{2}$  cubic yard each. The equipment shall provide adequate facilities for the accurate measurement and control of each of the materials entering the concrete. The complete plant assembly, including provisions to facilitate the inspection of all operations at all times and the adequacy and dependability of each of its parts shall be subject to the approval of the contracting officer and shall conform to the following requirements:

(1) It shall be capable of ready adjustment for compensating for the varying moisture content of the aggregates and for changing the proportionate batch weights.

(2) It shall be capable of controlling the delivery of all material within 1 per cent by weight of the specified amounts.

(3) It shall be arranged to permit the convenient removal of the material in excess of the specified tolerances.

(4) It shall include a visible dial or any suitable device which will accurately register the scale load at any stage of the weighing operations from zero to full capacity.

(5) The accuracy of the weighing equipment shall conform to the requirements of the U. S. Bureau of Standards and shall be tested monthly or otherwise when required at the expense of the contractor.

(6) It shall include a device for accurately measuring and indicating the quantity of water entering the concrete, and the operating mechanisms must be such that no leakage will occur when the valves are closed.

(7) It shall include a device for accurately and automatically measuring and indicating the time required for mixing, which may be interlocked to prevent the discharge of concrete from the mixer before the end of the mixing period.

(8) It shall include a device for properly recording and indicating the number of batches handled.

b. Time. - The minimum time for mixing each batch, after all materials are in the mixer, shall be as follows:

$\frac{1}{2}$ to $1\frac{1}{2}$ cu. yd. mixer	$1\frac{1}{2}$ minutes
Larger than $1\frac{1}{2}$ cu. yd. mixer	2 minutes

The mixer shall revolve a minimum of 12 revolutions after all materials have been placed in it, and at a uniform speed. Neither speed nor volume capacity of the mixer shall exceed those recommended by the manufacturer. Excessive overmixing, requiring additions of water to preserve the required consistency, will not be permitted.

c. Conveying. - Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. It shall be deposited as nearly as practicable in its final position. Conveying of concrete by means of chutes will not be permitted except for short chutes in the forms to distribute the concrete. Chutes used shall be such that the concrete slides in them and does not flow. Chutes with a flatter slope than 1 on 2 will not be permitted. There shall be no free vertical drop greater than 5 feet except where specifically authorized by the contracting officer.

d. Placing. - (1) Concrete shall be placed before initial set has occurred, and in no event after it has contained its water content for more than 45 minutes.

(2) Unless otherwise specified, all concrete shall be placed in the dry upon clean, damp surfaces, free from ice, frost, or running water, and never upon soft mud, dry porous earth, or upon fills that have not been subjected to approved rolling, puddling or tamping so that ultimate settlement has occurred.

(3) Rock surfaces upon which concrete is placed shall be approximately horizontal or stepped, rough, and free from loose material or other matter interfering with a satisfactory bond. The rock shall be washed, scrubbed with steel brushes or brooms, and spread with a layer of mortar about 1/2 inch thick, immediately before the concrete is placed. The mortar shall be of the same cement-sand ratio as used in the concrete.

(4) Unless otherwise specifically authorized or directed, concrete in mass structures shall be placed in monoliths not exceeding 40 feet in length or width. The layout of all monoliths shall be as directed or approved by the contracting officer before concreting is commenced.

(5) All concrete shall be deposited in approximately horizontal layers not to exceed 24 inches in thickness unless otherwise specifically authorized or directed by the contracting officer and the concreting shall be carried on as a continuous operation, as far as practicable, until the placing in the course, section, panel or monolith is completed. Unless otherwise shown on the drawings, courses shall generally have a minimum thickness of 4 feet, and a maximum of 18 feet, except that in hot weather the contracting officer may direct the maximum be reduced to 8 feet. A minimum time interval of 48 hours shall be allowed between successive courses for the dissipation of heat of hydration.

(6) Concrete shall be placed with the aid of mechanical vibrating equipment as approved by the contracting officer. Vibration shall be transmitted directly to the concrete, and in no case shall it be transmitted through the forms. The frequency of vibration shall be not less than 5000 per minute. The intensity of vibration shall be suf-

ficient to cause flow or settlement of the concrete into place. The vibration shall be of sufficient duration to accomplish thorough compaction as approved by the contracting officer. Vibration shall be supplemented by forking or spading by hand adjacent to the forms on exposed faces in order to secure smooth, dense, even surfaces. The concrete shall be compacted and worked in an approved manner into all corners and angles of the forms and around reinforcement and embedded fixtures.

(7) In dropping concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. On flat surfaces, where the congestion of steel near the forms makes placing difficult, a mortar of the same cement-sand ratio as is used in the concrete shall be first deposited to cover the forms.

(8) All top surfaces not covered by forms and which are not to be covered by additional concrete or backfill shall be carried slightly above grade and struck off by board screed (see Paragraph 7-15).

e. Construction joints. - Vertical joints shall be formed with tongue-and-groove bonds or keys at such locations and of such shapes and dimensions as approved or directed by the contracting officer. Horizontal joints shall be formed as shown on the drawings or, where horizontal pressure is always in one direction, with steps. Where required, dowel rods shall be used. All concrete in vertical members shall have been in place not less than 12 hours, and longer if so directed by the contracting officer, before concrete in horizontal members resting thereon is placed. As soon as practicable after placing and immediately before placing the succeeding layers is resumed, all approximately horizontal surfaces shall be washed with a high pressure air-and-water jet or cleaned as otherwise directed by the contracting officer. Sand shall be added to the air-and-water jet when required, to remove alkali, algae, stains, and other substances injurious to the bond. The time and method of using the jet shall be such that all laitance, scum, etc. will be removed so that partly embedded aggregate is not disturbed and is washed clean. After final cleaning and immediately before placing is resumed, the surfaces shall be wetted and spread with a layer of mortar 1/2 inch thick, thoroughly brushed in. The mortar shall be the same cement-sand ratio as the concrete. Where specified or otherwise required by the contracting officer for watertight construction, copper strips not less than 12 inches in width and weighing not less than 20 ounces per square foot, properly crimped or bent, shall be placed in the concrete to span the joint.

f. Cold weather. - Concrete shall not be placed when the ambient atmospheric temperature is below 35 degrees F., nor when the concrete is likely to be subject to freezing temperatures before final set has occurred, unless specifically authorized by the contracting officer in writing. When so authorized, the materials shall be heated in order that the temperature of the concrete, when deposited, shall

be not less than 50 degrees F. nor more than 70 degrees F. All methods and equipment for heating shall be subject to the approval of the contracting officer.

g. Hot weather. - For concrete placed during the extremely warm summer months and otherwise, when directed by the contracting officer, the aggregates shall be cooled by frequent spraying in such manner as to utilize the cooling effect of evaporation. During such periods the placement schedule shall be arranged as approved by the contracting officer in such manner as to provide time for the temperature of the previously placed course to begin to recede. The mixing water shall be the coolest available at the site insofar as is practicable.

7-14. Test specimens. - a. Number. - Test specimens, to determine whether the compressive strength of the concrete is in accordance with that specified in Paragraph 7-03, will be taken by the inspector. At least 1 set of 3 specimens will be made for every major pour and in general for every 100 cubic yards of concrete placed, but in any event, a sufficient number of specimens will be taken to give a comprehensive knowledge of the concrete in each section of the work.

b. Method. - All specimens will be taken from the concrete at the mixing plant. The specimens will be tested by the Government at the Central Concrete Laboratory, West Point, New York. All costs of transportation and testing of specimens will be borne by the Government.

7-15. Finishing. - Immediately after placement, the concrete shall be properly forked back along the faces of all forms by the use of standard concrete forks or spades unless otherwise specifically authorized or directed by the contracting officer. The finished surfaces shall be free from sand streaks or other voids and the plastering over of such surfaces will not be permitted. Defective concrete shall be repaired by cutting out the unsatisfactory material, to a depth of not less than 2 inches, and placing new concrete which shall be formed with keys, dovetails or anchors to attach it securely to the other work. One anchor shall be placed for each 64 square inches of area and the sides of the cut areas shall be generally rectangular. This concrete shall be drier than the usual mixture and shall be thoroughly tamped into place behind forms securely fastened. Unless otherwise specified, all surfaces of concrete not covered by forms, that are not to be covered by additional concrete, or backfill, shall have a wood float finish without additional mortar, and shall be true to elevations as shown on the drawings. Care shall be taken to see that all excess water is removed before making this finish. Other surfaces shall be brought to the specified finished elevation and left true and regular as approved by the contracting officer. Where considered necessary by the contracting officer, or where indicated on the drawings, joints shall be carefully made with a jointing tool. Every precaution shall be taken by the contractor to protect finished surfaces from stains or abrasions. No fire shall be permitted in direct contact with any concrete at any time. Concrete surfaces or edges likely to be injured during the construction

period, shall be properly protected by leaving the forms in place, or by erecting covers satisfactory to the contracting officer.

7-16. Curing.-- a. Warm weather. - All concrete shall be adequately protected from injurious action by the sun. Fresh concrete shall be protected from heavy rains, flowing water, and mechanical injury. All concrete shall be kept wet for a period of not less than 14 days by covering with water, or with an approved water-saturated covering, or by a system of perforated pipes or mechanical sprinklers, or any other approved method which will keep all surfaces continuously (not periodically) wet. Where wood forms are left in place for curing, they shall be kept wet at all times to prevent opening at the joints and drying out of the concrete. Water for curing shall be generally clean and entirely free from any elements which in the opinion of the contracting officer might cause staining or discoloration of the concrete.

b. Cold weather. - Concrete when placed during cold weather shall be kept moist and provided with adequate protection for a period of not less than 14 days, subject to the approval of the contracting officer, so that the air in contact with the concrete will be maintained at temperatures between 50 degrees F. and 70 degrees F. for at least the first 5 days of the curing period. For massive sections, where the atmospheric temperatures are sufficiently low in the opinion of the contracting officer to cause excessively rapid cooling and contraction of the exterior surfaces, this period for maintaining the temperature of the air in contact with the concrete between 50 and 70 degrees F. shall extend over the entire curing period. Salt or other chemicals shall not be admitted into the mixture to prevent freezing except with the approval of the contracting officer.

#### FORMS, REINFORCEMENT, AND PAYMENT

7-17. Forms. - a. Materials. - Forms shall be of wood, steel, or other approved material, except that where lining is not specified the sheeting for all exposed surfaces shall be tongue-and-groove lumber of uniform width unless otherwise specifically authorized. Forms of like character shall be used for similarly exposed surfaces in order to produce a uniform appearance. The type, size, shape, quality and strength of all materials of which the forms are made shall be subject to the approval of the contracting officer.

b. Construction. - Forms shall be built true to line and grade, and shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports. Responsibility for their adequacy shall rest with the contractor. Their surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. Bolts and rods used for internal ties shall be so arranged that, when the forms are removed, all metal will be not less than 2 inches from any concrete surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering and discoloration will be



objectionable. All forms shall be so constructed that they can be removed without hammering or prying against the concrete. Unless otherwise indicated, suitable moldings shall be placed to bevel or round exposed edges, at expansion joints or any other points as may be required by the contracting officer.

c. Coating. - Forms for exposed surfaces shall be coated with a non-staining mineral oil which shall be applied before the concrete is placed. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling, immediately before the placing of concrete, except that in freezing weather oil shall be used.

d. Removal. - Forms shall not be removed without the approval of the contracting officer, and all removal shall be accomplished in such manner as will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum number of days indicated below, except when specifically authorized by the contracting officer. When, in the opinion of the contracting officer, conditions on the work are such as to justify it, forms may be required to remain in place for longer periods.

Arches, beams and slabs	14 days
Columns	7 days
Walls and vertical faces	2 days

e. Form lining. - In addition to the requirement for work specified above, wood forms for walls which will be visible in the finished structure, and at other locations indicated on the drawings or as directed by the contracting officer, shall be lined with sheet steel or with pressed wood sheets similar to Masonite or approved equal. Lining shall be applied directly to the sheeting. The jointing of the lining shall be neat and close and no patch pieces, plugs, cleats or blocking will be permitted. Overrun of lining shall be trimmed to secure proper fit to adjoining surfaces. Lining with bruises, imprints or hammer marks shall not be used.

7-18. Furnishing, bending, and placing steel reinforcement. - (Item 13).. - a. Work included. - (1) The contractor shall furnish, cut, bend, and build into the concrete, in accordance with the drawings and directions, all reinforcing steel of deformed bars, dowels or anchors, steel plates for water stops across contraction joints, if any, or any other plain steel for similar purposes.

(2) Steel reinforcement may be cut and bent at the mill or in the field. All bending shall be in accordance with standard approved practice and by approved machine methods.

b. Materials. - (1) Reinforcing steel shall be of new billet, intermediate grade, open-hearth steel, deformed, and shall conform to the Federal Specifications QQ-B-71a for "Bars, reinforcement, concrete, Type "B", Grade 2," (dated January 12, 1938). If available, certified

copies of any mill test required shall be furnished by the contractor and the steel shall be subjected to such tests as the contracting officer may consider necessary to establish its quality, including particularly the requirements of bending and elongation. The steel shall be free from oil, paint, dirt or excessive rust.

(2) Expanded metal reinforcement may be used as an alternate for horizontal reinforcement only in walls. This reinforcement shall consist of a diamond shaped steel mesh manufactured from open-hearth steel, by a cold drawn process which will cut and draw the material so that uniform strands are formed at regular intervals along the length of the sheet with the plate intact between successive strands. It shall possess ductile properties which will permit any strand to be bent through an angle of 180° over one diameter, without fracture, and to have a yield point of not less than 55,000 pounds per square inch. The size of the diamond shall be approximately 3 inches by 8 inches, and the effective cross sectional area shall be not less than 0.30 square inches per foot of width, similar or equal to Style No. 3-9-30, as manufactured by the Consolidated Expanded Metal Companies, Wheeling, W. Va.

c. Placing. - (1) All steel reinforcement shall be placed in the exact positions and with the spacing shown on the drawings or ordered, and it shall be so fastened in position as to prevent its becoming displaced during the placing of the concrete. The clear distance between parallel rods shall be not less than one and one-half times the diameter of round rods, or twice the side dimensions of square rods, and unless specifically authorized, shall in no case be less than 1 inch.

(2) Except where otherwise indicated, reinforcement shall be placed as follows:

(a) All main reinforcement shall be placed not less than 3 inches from any surface.

(b) The covering of stirrups, spacer rods, and similar secondary reinforcement may be reduced by the diameter of such rods. The above dimensions shall be measured from the face of the reinforcement to the face of the forms.

(c) Where splices in reinforcement, in addition to those indicated are necessary, there shall be sufficient lap to transfer the stress by bond as may be directed. Rods shall be lapped not less than 40 diameters and splices shall be staggered. The lapped ends of rods shall be separated sufficiently or connected properly to develop the full strength of rod. Adjacent sheets of mesh reinforcement shall be spliced by lapping not less than 6 inches, the lapped ends being securely wired together.

d. Protection. - Steel for reinforcement shall be new un-

rusted stock, free from loose scale. It shall be at all times satisfactorily protected from moisture until placed in final position. Ends of rods that are to be left projecting for a considerable time shall be protected from corrosion by heavy wrappings of burlap saturated with bituminous material.

7-19. Embedded items. - In addition to reinforcing steel, there shall be built into, or set, or attached to the concrete, pipes, inspection wall frames, and covers, and other metal objects as shown on the drawings or ordered. All necessary precautions shall be taken to prevent these objects from being displaced, broken, or deformed. Before placing concrete, care shall be taken to determine that any embedded metal or wood parts are firmly and securely fastened in place as indicated. They shall be thoroughly clean and free from paint or other coating, rust, scale, oil, or any foreign matter. The embedding of wood in concrete shall be avoided whenever possible, metal being used instead. The concrete shall be packed tightly around pipes and other metal work so as to prevent leakage and secure perfect adhesion.

7-20. Expansion and contraction joints. - Expansion and contraction joints shall be constructed at such points and of such dimensions as may be indicated or required. The method and materials used shall be subject to the approval of the contracting officer and the materials shall conform to Federal Specifications wherever applicable. Unless otherwise indicated on the drawings, or required by the contracting officer, expansion joints shall be made by coating concrete surfaces with two coats of approved asphaltic emulsion or a single coat of bituminous cement to which premoulded sponge rubber or compressed cork filler  $\frac{3}{8}$ " thick shall be applied and such filler thoroughly covered with asphaltic emulsion or bituminous cement as specified above. In no case shall corner protection angles or other fixed metal embedded in the surface of the concrete and bonded, be continuous through an expansion joint. Payment for all expansion joint material shall be included in the contract unit price for concrete.

7-21. Measurement and payment. - a. Portland cement (Item 11). - (1) The quantity to be paid for under Item 11 will be the number of barrels of cement used in all parts of the work unless specifically excepted. For purposes of payment, a barrel of cement shall be considered 376 pounds net of cement. The contract unit price for the cement shall include payment for all expenses incidental to delivering the cement upon the work in which it is to be used.

(2) Only the cement furnished for work to be done under Item 12 will be paid for under Item 11. Cement used for mortar or grout under other items will be included in the payment for those items.

b. Concrete. (Item 12). - See Section VIII.

c. Reinforcement (Item 13). - The quantity to be paid for under Item 13 will be the number of pounds of steel placed in accordance with the drawings or orders, measured as specified. It will not include any waste material due to the fact that the lengths supplied are too long for their purpose. The quantity paid for will, however, include extra metal in laps, where authorized, due to the fact that single bars would be unreasonably long. In computing the weights, the theoretical weight of plain bars will be used as tabulated in Federal Specification QQ-B-71a for the lengths ordered; for expanded metal reinforcement of the type specified, one square foot shall be assumed to weigh 1.02 pounds. Wire or metal clips, and other supports necessary to hold the steel in place will not be considered as reinforcement but shall be furnished by the contractor without additional compensation. The contract unit price for Item 13 shall include furnishing, bending, cutting, placing, fastening in position, coating and protecting the reinforcement, and all other work and materials connected therewith (see Paragraph 7-18a).

SECTION VIII. CONCRETE - CLASS "A" (Item 12).

8-01. Work included. - Under this classification will be included all Class "A" concrete in the concrete flood wall, inspection wells, closing of the existing manhole and other appurtenant structures, all of which shall be constructed as shown on the drawings and in accordance with the specifications, with modifications as directed by the contracting officer. Concrete shall conform to all of the requirements of Section VII for concrete of the class specified. Surfaces of concrete shall be finished as specified in Paragraph 7-15 except as otherwise specified in this section or indicated on the drawings.

8-02. Description. - Class "A" concrete shall be placed between the required limits as shown on the drawings. Concrete for the footings shall be placed in the dry upon foundations properly prepared in accordance with the requirements of Section III. The forms for the exposed wall faces shall be lined with pressed wood, "Masonite" or equal. Concrete fins formed at the joints of the form lining on the exposed wall faces shall be removed after the forms are stripped. Tile pipe and miscellaneous metal work shall be set and concreted in place, except as shown on the drawings.

8-03. Measurement and payment. - The quantity to be paid for under Item 12 will be the number of cubic yards of Class "A" concrete satisfactorily placed within the required limits. No deduction will be made for openings having a cross sectional area less than that of a 12-inch pipe, nor for the space occupied by reinforcing steel, miscellaneous metal, wood nailing strips, or by other materials required to be built into the concrete. Payment shall include all costs of furnishing materials, erecting and removing forms, mixing and placing concrete, except that cement, reinforcing steel and other metal work are included under other items (see Paragraph 7-21). Payment will be made at the contract unit price for Item 12, "Concrete, Class "A".

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SECTION IX. METALS AND EMBEDDED ITEMS (Items 14 and 15).

9-01. General. - All metals, unless otherwise specified, shall conform to applicable Federal Specifications, and, when not covered thereby, to applicable A.S.T.M. specifications. All castings shall have the pattern or mark number cast on them. Unless otherwise authorized by the contracting officer, the scale weights of each casting or forging after machining shall be within 5 per cent of the weights as calculated from the dimensions specified or shown on the drawings. Castings shall conform, at the minimum section thereof, to the following dimensional tolerances: where embedded in concrete, to within 1/8 inch; where not embedded in concrete, to within 1/16 inch of the dimensions shown on the drawings.

9-02. Materials and workmanship. - a. The articles included in Items 14 and 15, other miscellaneous materials, and all metals required in the work except as otherwise specified, shall meet the requirements of the following specifications where applicable to the use intended:

(1) Iron castings, gray: Federal Specifications QQ-I-651, class as indicated. Tensile tests and chemical analysis will not be required.

(2) Iron castings, semi-steel: Federal Specifications QQ-I-656 for "Iron Castings, High Test (semi-steel)", class as indicated. Tensile tests will not be required.

(3) Malleable iron castings: Federal Specifications QQ-I-666, Type "A".

(4) Bolts, screws, and washers: Appropriate Federal Specifications and current standard practice, unless otherwise specified.

(5) Sheet copper: Federal Specifications QQ-C-501, Type V, Class A.

(6) Zinc coatings (hot galvanized): Federal Specifications QQ-I-696.

(7) Solder: Appropriate Federal Specifications QQ-S-571 and QQ-S-551.

(8) Other items, unless otherwise specified, shall conform to current standard practice for the material required and use intended.

9-03. Galvanizing and painting. - a. Galvanized iron or steel articles, shall be galvanized by the hot-dip process unless otherwise permitted. Injuries to the galvanizing shall be satisfactorily repaired. Provision shall be made for protecting threads either by counter-boring fittings, so as to cover threads or by cutting threads so as to make a very loose fit before galvanizing and carefully rerunning threads after

galvanizing so as to leave a good coating all over threads. Hot galvanizing shall be of such quality as to endure at least 4 one-minute immersions in copper sulphate solution, in accordance with the requirements of the Preece test.

b. All metal to be exposed in the finished work shall be thoroughly cleaned and then thoroughly and evenly painted with one coat of red lead paint and two coats of an approved lead-and-oil paint to the satisfaction of the contracting officer. No painting shall be done until the condition of the surface to be painted has been approved. The paint shall be applied by either brush or spray in a neat, thorough, and workmanlike manner, and in no event shall any paint be applied in freezing, rainy, or misty weather. The paint used shall conform to the requirements of Federal specifications of Group "TT"; and samples of paint shall be submitted to the contracting officer for approval and selection.

9-04. Miscellaneous iron and steel (Item 14). - a. Inspection well frames and closed covers similar and equal to the Construction Castings Corporation Type 135H, No. 27561, and manhole steps shall be installed as shown on the drawings.

b. Payment will be made as specified in Paragraph 9-06.

9-05. Copper water stops (Item 15). - Copper water stops required for the construction joints and expansion joints of concrete work shall be furnished and installed. Copper water stops used in concrete expansion joints shall be continuous, and shall be crimped. Splicing of the water stops shall be done by overlapping, and brazing or soldering. Unless otherwise specified on the drawings the material shall be 20-ounce sheet copper of approved standard. At expansion joints the crimp shall be filled with a mastic filler of "elastite" or equal as manufactured by Philip Carey Company, Cincinnati, Ohio. Copper water stops shall be placed in the expansion joints indicated on the drawings, and in construction (field) joints only as directed by the contracting officer.

9-06. Measurement and payment. - The quantities to be paid for under Items 14 and 15, will be the number of pounds respectively furnished and installed in accordance with the drawings and specifications. Wherever practicable, the quantities shall be determined by weighing the articles. When weighing is not practicable, the weight will be determined by the contracting officer, who will use for that purpose manufacturers' weights, catalog weights, or computed weights. The weight of all tare, packing, and blocking will be deducted, using only net weights for payment quantities; provided, that no payment will be made for any weight in excess of 5 per cent more than the computed weight as determined from the drawings.

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SECTION X. MISCELLANEOUS (Items 16 to 18, inclusive).

10-01. Placing topsoil, sodding and seeding. (Items 16 and 17). -

a. Work included. - The contractor shall furnish and place topsoil on the riverside berm adjacent to the concrete wall as shown on the drawings, and on other areas as required by the contracting officer. The finished dimensions of the berm shall be approximately as shown on the drawings. Under Item 16, acceptable topsoil shall be placed to the required depth over the required areas. Under Item 17, the prepared topsoil surface shall be sodded and seeded when and as directed by the contracting officer. The words "soil or topsoil" shall mean the material comprising the surface layers of the ground containing varying amounts of organic matter.

b. Placing topsoil. - Upon completion of the work required under Items 6, 7 and 8, the contractor shall apply the stored topsoil (see Paragraph 3-03a(2)) or additional acceptable topsoil if required, to the required depth when compacted, over the berm to the limits shown on the drawings. The topsoil shall be lightly rolled or tamped and any unevenness of surface shall be corrected to conform to finished grades.

c. Sodding. - (1) The areas indicated on the drawings shall be planted by spot sodding with living sods of Bermuda or other acceptable grass which will best meet the climatic conditions as approved by the contracting officer. Sods obtained by the excavation operations (see Paragraph 3-03a(2)) may be used if approved by the contracting officer. Each sod shall have an area of not less than 16 square inches. Sods shall be placed not more than 18 inches center to center for the minimum-sized sods; larger sods may be spaced proportionately, depending on their size. Sods shall be covered with 1/2 to 1 inch of earth, in such manner as to protect the roots from drying out. Sods shall be placed as soon as practicable after cutting, and newly placed sods shall be kept moistened by sprinkling when and as required by the contracting officer for the entire period of the contract.

(2) Sodding shall be commenced immediately upon completion of the berm to final grade and cross section and shall be prosecuted at a rate satisfactory to the contracting officer. Seeding shall be done to supplement the sodding operations.

d. Seeding. - (1) Preparation. - All grass or cover crop seed shall be sown at the earliest practicable date, or when directed by the contracting officer, so as to secure the greatest possible protection against erosion. The finished surface grade of the slopes shall be maintained in a true and even condition during the seed-sowing operation, and the contractor shall rake the soil to a depth of three-quarters of an inch (3/4") by using iron rakes immediately previous to sowing seed. All raking shall be done in a direction parallel to the contour lines on the slope and not uphill or downhill. All sticks, stones, weeds or



trash appearing on the surface shall be removed.

(2) Seed mixture. - The following mixture will be approved for each acre of seeding:

Perennial Rye Grass	7 lbs.
Orchard Grass	15 lbs.
Hard Fescue	4 lbs.
Kentucky Blue	6 lbs.
Sheep Fescue	6 lbs.
Timothy	7 lbs.
Perennial Red Clover	4 lbs.
White Clover	4 lbs.
Red Top	7 lbs.

Total per acre      69 lbs.

For all seeded areas, about 15 pounds of oats per acre shall be added if the planting is done between the middle of June and the middle of September, and about 15 pounds of winter rye per acre shall be added if the planting is permitted and done in the late season after the middle of September.

(3) Method of seeding. - The contractor shall take advantage of favorable weather and shall employ a method of sowing satisfactory to the contracting officer. The seed shall be raked in and the whole surface then lightly rolled. Seeding shall be done immediately after the preparation of the earth surface unless otherwise directed. If there be any delay, and if weeds grow in and with the grass, such weeds shall be cut before they go to seed or at such time as directed by the contracting officer. If any loam is washed away or any portions of the seeded areas are not covered by grass, the contractor shall replace the topsoil, fertilize and re-seed.

(4) Maintenance. - The contractor shall maintain the areas sown to grass seed on each section of the project, until all work on the entire contract has been completed and accepted by the contracting officer. This maintenance shall consist of occasional mowing with a scythe or mechanical mower, watering during periods of drought, and removal of conspicuous weeds, or any other similar operations whenever required by the contracting officer. The turf areas shall be fertilized with an acceptable commercial lawn fertilizer of a quality equal to Vigoro or Scott's lawn fertilizer at the customary quantity per acre recommended by the manufacturer.

e. Measurement and payment. - (1) The quantity of topsoil to be paid for under Item 16 will be the number of cubic yards actually placed in accordance with directions, measured after compacting, whether obtained from stockpiles or from other sources at the expense of the contractor. Payment shall include the costs of all labor, materials and expenses incidental to furnishing and placing the topsoil. Payment will

be made at the contract unit price for Item 16, "Topsoil."

(2) The quantity to be paid for under Item 17 will be the number of acres sodded and seeded as directed. The measurement will be the actual superficial areas sodded and seeded. Payment shall include all costs for sodding and seeding as specified in subparagraphs c and d above, and for all materials and expenses incidental thereto. Payment will be made at the contract unit price for Item 17, "Sodding and Seeding."

10-02. Closing existing manhole (Item 18). - a. Work included. -

(1) The contractor shall remove the upper portion of the existing manhole at traverse Station 81+00 as shown on the drawings. The manhole cover, frame and other miscellaneous materials shall be salvaged and shall become the property of the Government.

(2) The existing manhole shall be retopped with concrete and backfilled as shown on the drawings.

b. Construction methods. - The contractor shall do all work required to excavate, remove, and dispose of the materials in the upper portion of the existing manhole as shown on the drawings, being careful to avoid unnecessary breakage of the material or parts which may be salvaged. The soffit of the new concrete top slab shall be formed with arched, corrugated sheet metal, which shall not be stripped but shall be left in place in the permanent structure. The new top shall be constructed of Class "A" concrete, conforming to all of the applicable requirements of Section VII. Compacted backfill shall be placed over the new concrete top as shown on the drawings and conforming to all applicable requirements of Paragraph 5-03.

c. Disposal of materials. - See Paragraph 2-05.

d. Payment. - (1) Payment for all work in connection with closing of the existing manhole and not specifically paid for under other items, shall be paid for at the contract lump sum price for Item 18, "Closing Existing Manhole."

(2) Payment for concrete in the new top slab will be made at the contract unit price for Item 12, "Concrete, Class "A".

(3) Payment for backfilling will be made at the contract unit price for Item 6, "Compacted Backfill."

10-03. Cleaning up. - a. Work included. - The contractor shall remove all construction equipment and all temporary structures built or used by him, shall remove rubbish of all kinds from the site of the work, and from any grounds which he shall have occupied within the limits of the work, and shall leave the site of the work in a clean condition satisfactory to the contracting officer. All materials salvaged shall be the property of the contractor, except as noted in Paragraph 10-02a.

b. Payment. - For all work, materials and incidentals required to clean up as set forth in a above, the contractor will receive no direct payment, but payment shall be considered as having been included in the contract prices for Items 1 to 18 inclusive.

United States Engineer Office,  
Providence, Rhode Island  
June 9, 1939.

STANDARD GOVERNMENT FORM OF BID

(Construction Contract)

(Place) \_\_\_\_\_

(Date) \_\_\_\_\_

To the District Engineer,  
U. S. Engineer Office,  
819 Industrial Trust Bldg.,  
Providence, R. I.

In compliance with your invitation for bids dated June 9, 1939  
and subject to all the conditions thereof, the undersigned

\_\_\_\_\_

a corporation organized and existing under the laws of the State of

\_\_\_\_\_

a partnership consisting of \_\_\_\_\_

\_\_\_\_\_

or an individual trading as \_\_\_\_\_

\_\_\_\_\_

of the City of \_\_\_\_\_

hereby proposes to furnish all plant, labor, and materials, and perform  
all work required for the construction of a concrete flood wall on the  
Connecticut River at Chicopee, Massachusetts, Springfield-Chicopee Town  
Line to High Ground, including all work indicated on the drawings, or  
required by the specifications, and such incidental work as needed or  
ordered in writing by the contracting officer, in strict accordance  
with the specifications, schedules, and drawings, for the consideration  
of the following prices:

Item No.	Designation	Unit	Quantity	Unit Price	Amount
1	Preparation of Site	acres	3.9		
2	Common Excavation	cu.yds.	16,300		
3	Removal of Existing Concrete Wall	" "	8		
4	Steel Sheet Piling	sq.ft.	37,000		
5	Gravel, Pea Stone, and Filter Sand	cu.yds.	2,700		
6	Compacted Backfill	" "	7,800		
7	Rock Fill	" "	2,500		
8	Riprap - Hand Placed	" "	3,800		
9	Tile Drains				
	a. 8" V.C. Pipe	lin.ft.	750		
	b. 8" V.C. Pipe (perforated)	" "	380		
	c. 12" V.C. Pipe	" "	710		
	d. 12" V.C. Pipe (perforated)	" "	350		
10	12-Inch Corrugated Metal Pipe (Including Seep Rings and Flap Valve)	job	-		
11	Cement	bbls.	3,800		
12	Concrete, Class "A"	cu.yds.	2,770		
13	Steel Reinforcement	lbs.	217,850		
14	Miscellaneous Iron and Steel	"	3,550		
15	Copper Water Stops	"	1,000		
16	Topsoil	cu.yds.	850		
17	Sodding and Seeding	acres	1.05		
18	Closing Existing Manhole	job	-		

TOTAL BID

Notes: - (1) All amounts and total given above will be subject to verification by the Government. In case of variation between unit bid price and totals shown by bidder, the unit price will be considered to be his bid.

(2) All bids must be for the entire work and must have each blank space filled.

(3) The quantities of each item of the bid as finally ascertained at the close of the contract, and the unit prices of the various items stated by the bidder in the accepted bid, will determine the total payments to accrue under the contract. The unit price bid for each item must allow for all collateral or indirect costs connected with it.

PLANT TO BE USED ON THE WORK

(See Invitation for Bids and Paragraph 1-09 of the specifications)

Note:-- Use separate line for each major item.

No.	:	Name	:	Kind	:	Capacity	:	Age and Condition
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Material Handling Equipment

Pumping Equipment

Rock Fill and Riprap Equipment

Excavating Equipment

Concreting Equipment

Pile Driving Equipment

Miscellaneous Equipment



EXPERIENCE. - (See Invitation for Bids)

LIST OF PERSONS TO BE EMPLOYED

(See Paragraph IX (b) of Invitation for Bids)

Occupation	No. Expected to be Employed	Number of Months Employed
Laborer		
Finisher, Concrete		
Watchman		
Fireman		
Foreman		
Carpenter's Helper		
Concrete Mixer Operator		
Powderman's Helper		
Air Compressor Operator		
Grader Operator		
Jackhammer Operator		
Pump Operator		
Tractor Operator		
Truck Operator		
Blacksmith		
Reinforcing Rod Bender or Placer		
Carpenter		
Electrician		
Derrick Operator		
Hoist Operator		
Power Shovel Operator		
Roller Operator		

It is hereby warranted that in the event award is made to the undersigned there will be used in the performance of the work covered by the contract only such unmanufactured articles, materials and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as noted below or otherwise indicated in this bid or authorized in the specifications.

The undersigned agrees, upon receipt of written notice of the acceptance of this bid within 60 days after the date of opening of the bids, to execute the standard form of Government contract, in accordance with the bid as accepted, and to give the required performance and payment bonds, with good and sufficient surety or sureties for the faithful performance of the contract and for the protection of all persons supplying labor and materials in the prosecution of the work, within 10 days after the prescribed forms are presented for signature.

Performance will begin within 10 calendar days after the date of receipt of notice to proceed and will be completed within 120 calendar days after date of said notice to proceed.

\_\_\_\_\_  
(Bidder)

\_\_\_\_\_  
(Address)

By \_\_\_\_\_  
(Name) (Title)

NOTE:-- Read Standard Government Instructions to Bidders before preparing this bid.